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QUEENSLAND AGRICULTURAL JOURNAL

VOL. XXXIV. 1 JULY, 1930. PART 1.

Event and Comment.

The Current Issue.

IN this issue, Mr. Easterby continues his interesting story of the development of the Queensland sugar industry. The first instalment of a valuable paper on the Brown Cutworm is contributed by Mr. Currie; while Mr. Roberts gives some timely advice on the right way of securing information concerning parasites. Mr. White has a useful note on the Margosa Tree and its allies. The comprehensive paper on the application of science to agriculture read by Dr. Richardson, of the Waite Institute, before the recent Science Congress in Brisbane, is also presented as a welcome contribution to current thought on rural economics. Reports on the Stanthorpe fruit industry and on the work of the Banana Experiment Station, by Mr. St. John Pratt and Mr. H. Collard, respectively, are of especial interest to fruitgrowers. Mr. George Williams has a useful description of the Thin-shelled Queensland Nut. The need of better class dairy cattle is discussed by Mr. McGrath; and sheep farming and sheep licks and their uses are Mr. Hodge's subjects for this month. A note on the eradication of diseases in pigs is Mr. Rudd's contribution. The equipment and accommodation necessary for a modern piggery is described and illustrated comprehensively by Mr. Downey. A new Journal feature is introduced under the heading of "The Young Farmer," which covers matters of topical interest to calf and pig club members. The Home and Garden Section is well supplied, and other regular features make up a well-balanced and profusely illustrated number containing a wide range of very useful information and general working notes. The July Journal will be welcomed, we feel sure, by our large and ever-extending circle of readers.

The Journal.

WITH this issue we are entering on our thirty-fourth year of publication. The *Queensland Agricultural Journal* was established in 1897; the first number was published in July of that year under the direction of the late Hon. A. J. Thynne, then Secretary for Agriculture and Stock, and the editorship of the late Major A. J.

Boyd, F.R.G.S. Essentially of a utilitarian character, the Journal has been devoted mainly to the dissemination of information of practical value to the man on the land. It has been published regularly ever since, and to date it has run into sixty-three volumes, thirty-one in the old series up to 1913, and thirty-three in the new series dating from January, 1914. Every effort has been made to maintain the high standard set by its founders and first editor. The general policy of the publication is designed on positive lines in consonance with progressive agricultural thought, development, and practice, and to be of real use and value to the working farmer. There are obvious limitations to an official publication of this character, as with other authoritative technical journals. It cannot, therefore, be looked upon in the ordinary sense as a popular magazine, or a journal of light and more or less irresponsible agricultural literature. But within those limitations, it is aimed to make it a useful, interesting, and informative publication of positive opinion that will appeal to the practical farmer. As the official organ, so to speak, of the Department of Agriculture and Stock, it is recognised that accuracy and soundness are essential if it is to preserve its authoritative character as a journal of agricultural and veterinary scientific research and record, and as a vehicle for the conveyance of Departmental advice and information.

Queensland Butter and Cheese.

BEFORE distributing the prizes won at the annual exhibition of the Queensland Butter and Cheese Factory Managers and Secretaries' Association, at the Hamilton Cold Stores, on 25th June, the Minister for Agriculture and Stock, Hon. Harry F. Walker, paid a tribute to the high standard set by the dairying industry in this State. He declared that the quality of the butter sold on the local market was the best in the world. He pleaded with dairymen to continue their good work in herd improvement; it was only by that means, he said, that Australia could hold and enhance her reputation as a dairying country. "I have been in close touch with the dairying industry for twenty-five years, and have noticed a great improvement not only as to quantity but for the most part as to quality. The exhibition to-day, I am told, constitutes a record. A record is something of which we can feel proud. To-day we are in touch with one of the principal industries of the State. Only a few years ago it was ranked as fifth or sixth. To-day it is nearly second. Moreover we find that the record is approximately 2,000,000 lb. above the previous record." Nevertheless, added Mr. Walker, the production in Queensland was not what it should be. Many people would have as the excuse the financial troubles which are besetting the world. In spite of this the primary producers had gone forward right through the year. With regard to butter there had been a big improvement in quality, but they had had to compete with many objectionable features which were to be encountered in a new country. They had to go further and continue that improvement and keep on the move. These facts were supported by the Managers' Association of Queensland, one of the finest organised bodies in Queensland, composed of men to whom he "took off his hat," and who had by industry and study put the butter-making industry on a sound footing. Queensland was forging ahead more than any of the other States. There had been much talk about the quality. But he would say without fear of contradiction that the quality of Queensland butter sent away was second to none received in the Old Country from any part of the British Empire.

Prices of Dairy Produce.

CONTINUING, Mr. Walker said that butter production had certainly suffered by the smaller prices, but thanks to the Paterson scheme and co-operation throughout the Commonwealth, the position was not as bad as it could have been. The dairy farmer had received lower export prices, and that meant that he had to lower his cost of labour and cost of production. But the time would come when the position would improve. They would all have to realise that they could not abuse the privileges of life as they had been abused in the past. Many factories, as a result, had realised the necessity and seized the opportunity of increasing and improving the methods of manufacture. Science demanded that factories should be kept up to date. Many of them by their work had sown conclusively that this was the wise policy, especially when the fraction of a penny per pound involved in the sale of a slightly inferior product was considered.

Efficiency of Queensland Farmers.

MR. Walker added that the same principle applied to the farmers. Old bails, old equipment, old and obsolete methods were passing out. Farmers to-day were realising the importance of keeping their plants up to the mark and economising in labour. While they did that they were working in sympathy with the factories. This

fact was most apparent in the quality of the dairy cattle exhibited at the various shows. In his capacity as Minister for Agriculture he had obtained increasing pleasure with the improvements which had been obvious in this direction. The cattle exhibited in the Burnett district would compare with any in the Old Country. He said that advisedly, realising what a big statement he was making. If they followed these lines they would obtain that great goal—a decrease in the cost of production. That decrease in the cost of production was the keynote of Australia's success. It was of no use talking about lowering wages until that was brought about. They had to economise.

From the farmer's point of view, economy was not the using of a poor cow when a good cow should be obtained. It cost almost as much to feed a poor cow as it did to feed a good one, and often a poor cow involved more labour because it was often harder to milk. All these were factors working towards this necessary economy, and the dairymen of Queensland had been imbued with the one object—to reduce cost—and they had done more towards that end than any other body of men he knew. Again, Mr. Walker emphasised the excellent quality of the cattle at country shows as an example.

Yet there was still a great deal to be done in order to keep pace with other States. He was big enough to acknowledge the good work done by the former Government in regard to the legislation on herd improvement. It was because certain men who had a monopoly of high-class stock had abused their privileges that the Government had been forced to reduce the subsidy on well-bred bulls from £50 to £25. If only one or two of the bull-breeders, who had this monopoly, had played the game fairly this reduction would never have taken place.

"I want you to instruct the dairymen in each of your districts to try to improve their herds," said Mr. Walker. "One thing they can all do—eliminate the wasters from the herds. But don't hold a compulsory sale and sell them all to your neighbour. Sell them to the butcher for beef."

In conclusion, Mr. Walker said that if any of those engaged in the industry had any practical or commonsense suggestions by which it could be improved, it would be their own fault if they were not brought forward and tried out. His department would be always willing to assist.

Visit of New Zealand Farmers.

ONE big event of the month, from a rural point of view, was the visit of a large party of New Zealand farmers who came to see for themselves how primary industries are developing in this State. They were also eager to exchange ideas on farming and stock-raising practice. While readily giving useful information on New Zealand conditions and methods, they, as shrewd observers, were out to acquire knowledge of our conditions of settlement and development. Their impressions of Queensland were freely voiced and were, in the main, most favourable. These will be reviewed in the August Journal.

The visitors came chiefly from the famous Canterbury Province in the South Island of the Dominion, while North Island was also strongly represented. The organisation of the tour was the last word in efficiency, and for this the Queensland Railway Department, in association with the Department of Agriculture and Stock, earned high praise from the Dominion visitors. Farmers and citizens of the districts through which they passed also assisted with typical Queensland hospitality.

The value of inter-dominion visits such as this is so obvious that it is scarcely necessary to unduly emphasise the fact. Apart altogether from the advantages on the technical side, there is the importance of our getting to know one another better, of our appreciation to each others' viewpoint, and of our understanding each others' ideas of the need of the closer association of the people of both the Commonwalth and the Dominion. After all, our destiny is identical, our difficulties are common, our national and imperial aspirations and problems are the same. The future of each country must be, from the geographical viewpoint alone, inseparable. But above that, there are our common ties of kinship. They with us possess all our cherished traditions as people of the one race, people endowed with the composite character of all the British peoples and their common genius for government and enterprise. Then there is the name we commonly share: the name coined in the Great War, when the blood of men of the Homeland and all the Overseas Dominions flowed in a common stream; the name that has become immortal; the name that is untarnishable; the name that stands for all that is great and noble in the history of our race—the imperishable name of Anzac.

THE QUEENSLAND SUGAR INDUSTRY.

By H. T. EASTERBY, Director, Bureau of Sugar Experiment Stations.

PART VII.

(b) Review of the Industry Since Federation

(continued).

HAVING traced to some extent the history of those mills established under "*The Sugar Works Guarantee Act of* 1893," and the taking over of certain of them by the Government in 1904, a return may be made at this juncture to the earlier years of the present century. The next noteworthy landmark in the history of the industry took place in 1906, when a Royal Commission was appointed by the Queensland Government to inquire into and report upon—

(1) The number of Pacific Islanders to be deported in Queensland at the end of 1906, their present residence, localities to which they have to be deported, and the most efficient manner of repatriating them with the probable cost thereof;

(2) Whether there be in the State of Queensland any Pacific Islanders whose compulsory deportation would be inconsistent with humanity or with good faith;

(3) Whether sufficient labour for carrying on the Queensland sugar industry is likely to be available when Pacific Islanders can no longer be lawfully employed, and, if sufficient labour for such purpose is not likely to be locally obtainable the best means of supplying the deficiency.

This Commission consisted of Messrs. R. A. Ranking, Police Magistrate, W. T. Paget, M.L.A., and C. F. Nielsen, M.L.A. The inquiry lasted from April to June, 1906, and a great deal of evidence was taken from millers, canegrowers, labourers, clergymen, police officials, missionaries, labour agents, tradesmen, Pacific Island inspectors, owners of recruiting vessels, Government agents, and the kanakas or Pacific Islanders themselves.

The evidence given before this Commission was of an interesting nature. The inquiry was held practically in the middle of the transition period from black to white labour and just before the increase in bounty paid for white-grown cane had got to work. One or two of the old type of millowner was still operating at that time who had no faith whatever in white labour. One at Mackay, who passed away two or three years after, was asked if he still had faith in the sugar industry and replied, "I have no faith in the sugar industry under the conditions we are supposed to submit to now. I have no faith in white labour. . . . I do not intend to try what I consider an impossibility. . . . Stimulated by the bonus and whilst good seasons last a false confidence in the future will be created, which, on the withdrawal of the bonus and recurrence of indifferent seasons, to which we are so liable, will create disaster. The withdrawal of the kanaka will gradually force the industry into Southern latitudes less congenial to the cane, but more

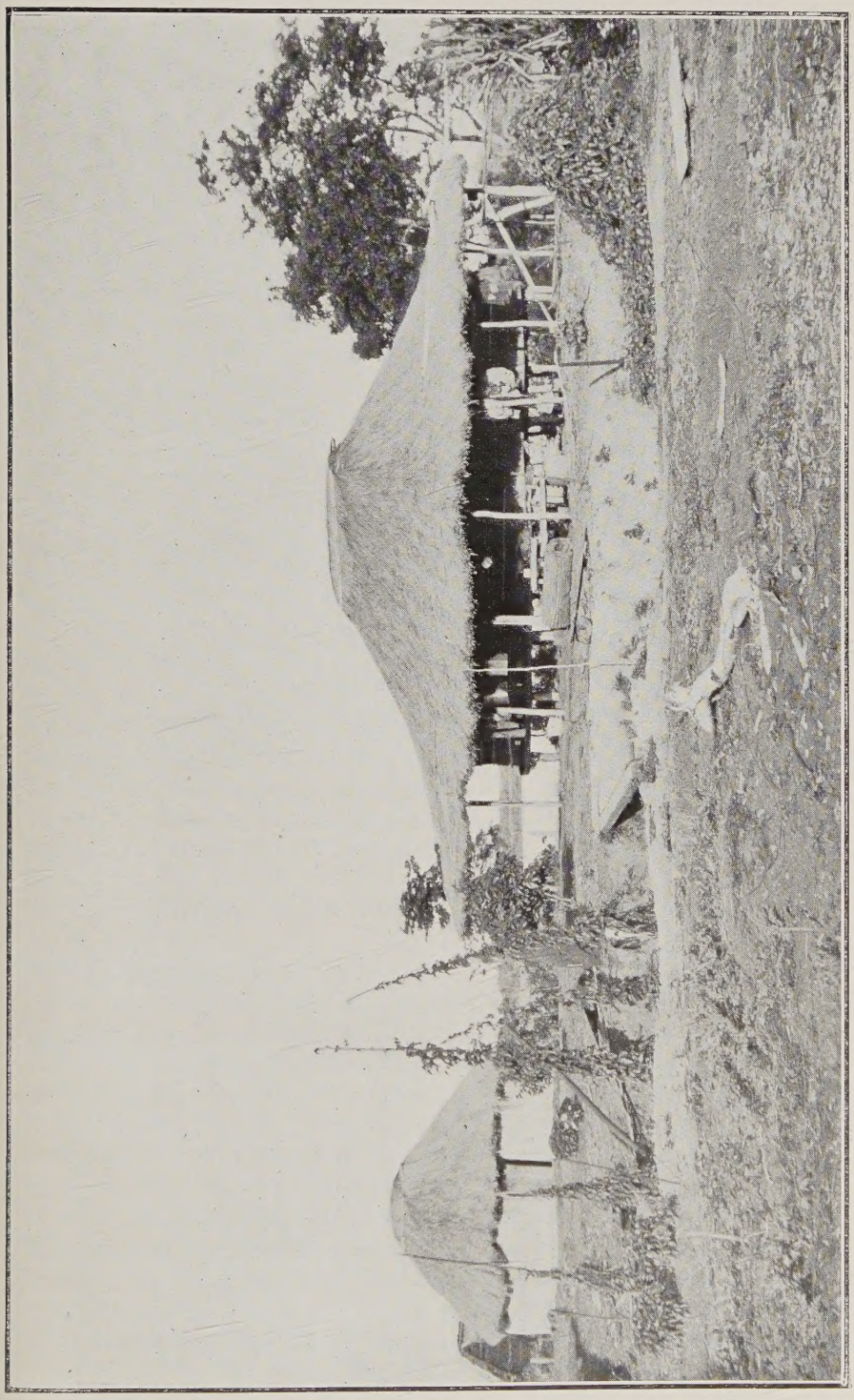

Plate I.—Kanaka Humpy at Mackay.

favourable for white labour." Other millowners and farmers reported favourably of their experience of white labour, and with the increase of the bounty intended to augment their white-grown areas.

Quite a number of Pacific Islanders gave evidence. Some of them had primitive ideas about marriage. One "boy" named Keeseree, native of Malayta Island, when asked if he had married an island woman, said he had married an aboriginal, but not in church—"No, I go along Inspector Durham and tell him I going to keep this woman and I keep her; I got one boy fifteen months old, no other pickaninny come up." He did not want to go back to the islands—"wanted to stop along Queensland." "I sorry for the woman, I no want to leave her here, but I frightened to take her home; I frightened man Malayta kill her."

Many of them did not want to leave for the islands. Their grievance mainly, at that time, was that they could not get work. Others said, "Suppose me get passage money and 'box' and 'everything,' me go home. Want tobacco, knives, axe, matches, and little fellow saucepan. Must have 'box'; my countrymen make a row alonga me if me have no box." Another had a letter written for him to the Commission, in which he said, "Many of us have been in this country for twenty to thirty years, and feel happy and content if we could get work, but we find the farmers refuse to engage us under the usual agreement, informing us that if they did so they would be made liable to pay our passage home, besides our wages after the latter end of this year."

The "box" referred to above contained the portable and personal property of the Pacific Islander and usually played a large part in his mental outlook.

The Commission's recommendations concerning the Pacific Islanders were that the following should be exempted from deportation at the end of 1906:—

(*a*) Those Pacific Islanders introduced into Australia prior to 1879.

(*b*) Those of extreme age or suffering bodily infirmity and unable to earn a livelihood if returned.

(*c*) Those being married to, or living as man and wife with, a native of some other island than his own, so that he could not be deported without risk to the life of himself or his family.

(*d*) Those married or living as man and wife with a female not a native of the Pacific Islands.

(*e*) Those having offspring educated in the State schools.

(*f*) Those who on 1st July, 1906, and still were, registered as the beneficial owner of a freehold in Queensland.

(*g*) Those who were holders of an unexpired leasehold, compensation for the relinquishment of which had not been paid him as provided either by the provisions of the lease or by law; or

(*h*) Those continuously resident in Australia for a period of not less than twenty years prior to 31st December, 1906.

The above recommendations with the exception of (*e*) and (*g*) were given effect to in the Commonwealth Pacific Islanders Act of 1906, but a certificate of such exemption could only be issued when a Pacific Islander had proved to the satisfaction of the Minister that he was so entitled.

With respect to the supply of white labour after the withdrawal of the Pacific Islanders, a number of recommendations were made for the establishment of Labour Intelligence Bureaus, where reliable information could be obtained regarding supply and demand, and that where Crown lands suitable for closer settlement existed within or adjacent to sugar districts same should be made available in relatively small holdings for occupation by workers of limited means; that efforts be made to ascertain the probable number of unemployed within the State and in the States of New South Wales and Victoria, and to bring under the notice of such workers the nature of the employment offering, and if necessary to disseminate such information in the United Kingdom and Continent of Europe. From this it will be seen that a fear existed once the kanaka was deported that there would not be sufficient white labour to take his place, but eventually it was realised that this fear was groundless and to-day there is far more labour offering than the industry can absorb.

The number of Pacific Islanders liable to be deported at the end of 1906 was estimated at 4,500, and many people will no doubt recollect the deportation of these Islanders. They could be seen making their way to the wharves carrying all sorts of junk, old iron, hurricane lanterns, violent-coloured petticoats, &c., and in some cases trying to smuggle firearms aboard—strapped to the women's legs under their petticoats. Eventually all that were to be deported were got away and little or nothing is now heard of the old blackbirding days.

The conditions surrounding white labour at most of the mills in the early part of the century were none too brilliant, nor of a nature to induce white men to remain permanently in the service of the mills, nor were they calculated to promote the interests of the mills themselves. The men were lodged in barracks which were constructed to accommodate from twenty-four to fifty or more men. The buildings were in some cases partitioned into rooms to hold from eight to twelve or more men in a room. In others there was no such division, and as many as fifty men could be found living indiscriminately in the same building.

As usual the majority of these men were of good habits, while the minority included men of different traits. This meant that the reliable and steady workmen had no chance or guarantee of quiet or rest either day or night. The Government at once took steps as far as the Central Mills were concerned to greatly improve the conditions by increasing the buildings for the housing of the men, partitioning same off into small rooms, so that not more than two men would occupy

one room and two men known to each other could live unmolested in privacy and quiet. Verandas were built to protect the rooms from heat and enable men to sit outside, and when nights were hot to sleep outside.

In the old days the bunks or sleeping provision for workmen were of the crudest character; the bunks were fixtures, the bedding used was dry grass, cane tops or even bagasse from the mills, and in no cases were mattresses provided. All these were swept away and rooms were cleaned and fumigated, and mattresses and pillows provided, while men were provided to dust out and clean the rooms; bathrooms and showers were installed as well as reading-rooms with ample table and seating accommodation. Provisions were also made for the insurance of the men. This resulted in great satisfaction to the white labour then employed at the Government Central Mills.

Shortly after these alterations had been made an Act known as "*The Shearers and Sugar Workers' Accommodation Acts,* 1905-1906" was passed, which provided for suitable accommodation for workers, ventilation, &c. Provision for 360 cubic feet per man was to be made in respect to sleeping accommodation, proper cooking and cleansing materials were to be supplied, and receptacles provided for rubbish, &c. This Act remained in force until superseded by "*The Workers' Accommodation Acts,* 1915 *to* 1921," which repealed the former Act. Better provisions were made in this new Act for the general comfort of workers, and 480 cubic feet of air space was to be allowed for each man in sleeping-rooms. Baths and an adequate supply of water were to be furnished wherever possible. Verandas were also to be provided. It will be noticed that most of these improvements had already been put into operation at those Central Mills under Government control prior to the passing of the above Acts.

In 1907 the Australian Sugar Producers' Association was formed in Townsville, as the result of a conference in that city organised by the Chamber of Commerce. This association has played a large part in the development and protection of the sugar industry since that date.

In 1909 the first Director of Sugar Experiment Stations, Dr. W. Maxwell, retired on the expiration of his agreement with the State Government. From 1905 to 1909, Dr. Maxwell was also Comptroller of Central Sugar Mills under Government control.

The year 1910 saw the record production of sugar to that date—viz., 210,756 tons of raw sugar—the previous highest yield being in 1907 when the production totalled 188,307 tons. The rainfall in 1910 was particularly heavy. The tonnage of cane per acre in that year was exceptionally good, the average for the whole State being 19·45 with 2·23 tons of sugar per acre.

In the following year, 1911, the great strike of sugar workers took place for higher wages and better conditions mainly for mill workers, but supported by the field labour and afterwards by the waterside workers. The first mutterings of the storm were heard at the beginning of the year, and in February a demand was made on the Australian

Sugar Producers' Association in respect of the wages and conditions in the industry. Bundaberg workers asked for 30s. a week and found, and the abolition of the contract system of cutting cane was also pressed for. As time went on the fight grew very bitter. There was a Commonwealth Labour Government in office at the time and members thereof took a more active part in the quarrel than they would think of doing nowadays. The Acting Prime Minister, Mr. W. M. Hughes, who was also president of the Waterside Workers' Association, is reported to have said he would repeal the duty on sugar as a means of cutting the Gordian knot. Mr. Tudor, Minister of Trade and Customs, visited the Bundaberg district and made many strong remarks. Mr. Bamford, the Federal Labour member for the Herbert, said at Mackay that he did not think the duty would be repealed, but he warned farmers to settle the strike, and implied that if it were not settled a proposal would be introduced and probably passed by the Federal Government to build a refinery in New Guinea. A Society of Free Workers was formed in Victoria and many men from that State and Tasmania found their way to Queensland and commenced work under protection. Riots took place at Childers, and seventeen men were arrested. A tram carrying free workers was attacked by strikers at Huxley; disorderly scenes were enacted at Bundaberg and other places, and a large number of the mills were manned by the farmers. Firearms were flourished and a good deal of hot feeling was engendered on both sides. The watersiders at Cairns and Sydney, and also at other ports, took a hand and refused to handle sugar. In August a conference was proposed which resulted in certain terms being accepted, and the calling off of the strike. The terms were as under:—

(1) Wages to be at the rate of 30s. a week and keep as a minimum for adult labour at the mills. Overtime to be at the rate of time and a-quarter.

(2) Ordinary week's work to be at above rates and limited to forty-eight hours per week.

(3) Time worked at ordinary rates not to exceed nine hours on any one day.

(4) Employers and employees to meet and endeavour to arrange mutually satisfactory agreements for the following season.

(5) No vindictive spirit to be shown to the men.

(6) Strike to be called off forthwith.

There is no doubt that the men were paid on too low a scale at the time of the strike and that the accommodation was not as good as it ought to have been. The regulations under the Bounty Act in 1912 fixed the minimum rates of pay for adults at 48s. per week, without keep, and the hours of labour forty-eight per week, as has been previously mentioned, but these rates have long since been passed in the successive increases that have been made since that date by Awards of Industrial and Arbitration Courts.

[TO BE CONTINUED.]

THE BROWN CUTWORM (*Euxoa radians* Guen.).

By G. A. CURRIE, B.Sc.

PART I.

Introduction.

THE brown cutworm is the larva of a noctuid moth, *Euxoa radians* Guen. In Queensland it is distributed over all the coastal agricultural areas and extends westwards over the coastal range into the closely settled districts of the Burnett, Callide, and Dawson Rivers. It has been recorded as far west as the Great Dividing Range in the Central district, and Mungallala in the Southern district of Queensland. It is common in New South Wales and West Australia and is recorded from Victoria, South Australia, and Tasmania. In Hampson's "Catalogue of the Noctuidæ," the records outside Australia are from New Zealand, Norfolk Island, and Friendly Islands.

In the caterpillar stage it is destructive to many crops of field and orchard, the most common form of damage being the severing of the stems of seedlings and the eating of the leaves.* (Plate I., figs. 5 and 6.)

Cutworm attacks on vegetable crops on light soils are of yearly occurrence in Queensland, always more or less severe in different localities, but the widespread and devastating attacks on cotton seedlings occur only sporadically, a break of a variable number of seasons usually occurring between attacks. This is true also for widespread attacks on maize seedlings and other field crops.

The pest is, then, of seasonal and sporadic appearance, the destruction it causes being most common in the spring months in Queensland, although in summer and autumn attacks may occur if conditions favour the species.

Among economic crops attacked in the seedling stage may be enumerated beans, beetroot, cabbages, carrots, cotton, maize, peas, tomatoes, and wheat.

In the investigation, the results of which are set forth in this paper, the chief crop studied was cotton, but attacks on many crops of field and garden were examined with a view to gaining all possible evidence.

In working out the general œcology of the cutworm a special study has been made of its rate of development in relation to temperature. It is hoped that the results of this study will aid in predicting outbreaks and so in controlling them.

LIFE HISTORY.

In tracing the life history of the species, a beginning will be made at the point where the adult moth emerges from the winter pupation, and thence each successive stage will be followed.

Adult.

After breaking through the pupal coverings and the earthen containing cells, the moths push their way to the surface of the ground and hang from the under surface of leaves or pieces of débris till the wings are stretched and have hardened. They then fly off to feed on nectar from the spring flowers in the evenings and at night.

Pairing takes place at night; the moths lying quiescent during the day, well hidden under débris. When disturbed they dart along near the ground in short flights reminiscent of the flight of a plump quail,

*Certain of the references made in this article refer to plates, graphs, &c., which will appear in subsequent parts.

then pitch suddenly out of sight under cover. Their colour harmonises well with their natural surroundings and they do not stir unless very closely approached.

Oviposition.

After pairing the females are ready for oviposition, the time elapsing between emergence and pairing, and between pairing and oviposition varying with the state of the weather and presence of suitable laying conditions. Warm weather will decrease and cold weather increase these periods. Table VI. shows the time elapsing between emergence and oviposition.

Eggs are laid under suitable host plants in loose soil when conditions are favourable. Ballard[1] found that a slightly moist soil under low growing weeds was a favourite position. It has now been found that when moths are ready to lay and host plants are present, they will also oviposit in fairly dry soil, and that a very wet soil is repugnant to them. When the soil is wet they tend to scatter the eggs over the host plant itself, contrary to their normal habit of laying a batch of eggs all together just under the loose surface of the soil.

The position chosen by the female for oviposition is important, as it has a bearing on control methods. In 1926, during the October and November attack, no eggs were found under cotton seedlings but all were found under low-growing shady host plants, particularly Bullhead (*Tribulis terrestris*). In 1924, however, eggs of *Euxoa radians* were found under cotton seedlings near Rockhampton, but it was not stated whether there were weeds associated with the eggs or not. The importance of the point is that if eggs are laid under the seedlings, such forms of control as barrier furrows round the fields are useless.

It would appear that where bushy plants of bullhead are available and the soil under them loose, the moths prefer them to anything else for oviposition. If the season is too early for such bushes to have developed, and if seedlings of cotton are available in loose soil, it is probable that the moths flying in from the headlands, or from surrounding vegetation where they shelter during the day, would lay under the seedlings in the first rows they happen to cross. More evidence is necessary on this point before it can be definitely determined.

In the laboratory eggs were almost invariably laid at night, but on one occasion oviposition was actually witnessed about 9 a.m. A female at her last lay and nearly exhausted was observed under the pigweed (placed there for cover) in the act of laying. She squatted on the loose soil surface and pushed the tip of her abdomen backwards and downwards into the loose soil. A slight convulsive movement of the abdomen marked the passage of an egg to the ovipositor. The tip of the ovipositor was then pushed downwards till it touched the false bottom of the container over which the loose soil had been scattered. The egg was placed against this false bottom and adhered to it by some cementing fluid. The wings were half extended and quivered gently all the while, scales being shed on the surface of the ground. After each egg was laid the body was moved slightly forward or sideways so that the eggs touched, but overlapped very little.

Eggs are laid in batches, generally one batch each night until the death of the female. The dead body of the female was frequently found in the field, lying over her last batch of eggs.

Table I. gives the numbers of eggs laid by some of the females reared in the laboratory.

The average number of eggs laid by this group is seen to be 500, but dissections of females caught in the field have yielded up to 1,200 eggs in the ovaries.

TABLE I.

Eurea radians GUEN., NUMBER OF EGGS LAID BY FEMALES REARED IN LABORATORY.

Average Temperature, 22·7° C.		Average Temperature, 22·7° C.		Average Temperature, 24·5° C.		Average Temperature, 24·5° C.		Average Temperature, 24·5° C.		Average Temperature, 26° C.		Average Temperature, 26·7° C.	
Moth Adult, 6th December, 1927.		Moth Adult, 10th December, 1927.		Moth Adult, 26th December, 1927.		Moth Adult, 26th December, 1927.		Moth Adult, 28th December, 1927.		Moth Adult, 30th January, 1928.		Moth Adult, 11th February, 1928.	
Date of Lay.	No. of Eggs.	Date of Lay.	No. of Eggs.	Date of Lay.	No. of Eggs.	Date of Lay.	No. of Eggs.	Date of Lay.	No. of Eggs.	Date of Lay.	No. of Eggs.	Date of Lay.	No. of Eggs.
1927.		1927.		1927.		1927.		1928.		1928.		1928.	
15th Dec. ..	23	17th Dec...	250	31st Dec. ..	63	31st Dec. ..	105	4th Jan...	61	3rd Feb...	569	14th Feb...	161
16th Dec. ..	24	18th Dec...	135	1928. 1st Jan. ..	224	1928. 1st Jan. ..	153	5th Jan...	123	..	..	15th Feb...	184
20th Dec. ..	137	19th Dec...	38	2nd Jan...	72	2nd Jan...	288	6th Jan...	139	..	..	..	..
21st Dec. ..	66	..	..	3rd Jan...	180	3rd Jan...	65	7th Jan...	218	..	..	..	..
..	..	..	..	4th Jan...	7	..	..	8th Jan...	147	..	..	..	..
..	..	..	..	..	..	..	..	9th Jan...	65	..	..	..	..
Totals ..	250	..	423	..	546	..	611	..	753	..	569	..	345

The average number of eggs laid by this group is seen to be 500, but dissections of females caught in the field have yielded up to 1,200 eggs in the ovaries.

Length of Adult Life.

As can be seen from Table I., the length of time between emergence of the adult female and oviposition varies with the temperature. The length of life of the adults varies in a similar way.

In the laboratory the length of life of males varied from about six days at an average temperature of 26 deg. C. to about twelve days at an average temperature of 22·5 deg. C.

The females were more variable, and their length of life varied from five to seventeen days, having an average of eleven days for forty individuals. It would appear that in the field females could live for a longer period if they were unable to oviposit owing to unfavourable conditions. They died immediately after their last lay, however.

Some females in the laboratory were found to lay abnormally large eggs which were invariably infertile. Others were swollen with eggs but failed to oviposit. Dissection showed that these females contained collapsed and unchitinised spermathecæ in strong contrast to the dark-coloured, firm, and highly chitinised spermathecæ of females laying normal fertile eggs.

Egg.

Laid under cover, the eggs are protected to a considerable extent from dessication, too great heat, and natural enemies. Exposure to direct sunlight will kill the eggs and an average shade temperature of 37 deg. C. is fatal to them in time. They hatch in from three days upwards. (Graph II. (D).)

In all batches of eggs experimented with it was observed that either the percentage fertility was complete (100 per cent.) or that the whole batch was infertile. In the field no infertile eggs have been seen.

Larval Instars.

When ready to emerge the tiny larvæ use their strong mandibles to break down a portion of the egg shell large enough to allow egress. They eat this portion of the shell but have not been seen to eat any more of it.

Hatching takes place at any hour, and the emerging larvæ are very active, moving with a looping gait like geometrid larvæ. In keeping with this habit the anterior two pairs of abdominal legs, or "larvapods," are reduced in size.

Very little, if indeed any, silk spinning is done in this instar. When disturbed on a food plant the small larvæ drop straight to the ground without putting out a silken thread, and then lie curled up amongst the débris. The reduced state of the spinneret, as shown in Plate VII., fig. 3, is in keeping with the absence of extensive silk spinning.

The larvæ are extremely active for some time after hatching, moving rapidly, and usually not feeding for some little time. They are positively phototropic and negatively geotropic, moving outwards and upwards from their place of origin. After their first burst of feverish activity they settle down on a convenient host plant to feed, but the effect of their first set of tropisms is to aid in their dispersal from the point of origin, although many individuals may remain on the plant under which they have been hatched.

For the duration of this first urge, food plants may be passed without any display of interest, but when the first urge is satisfied, feeding is

immediately resorted to. Owing to the relatively large size of the hollow setæ of this instar, and the light weight of the body, the wind can easily catch up the larvæ and aid in their dispersal.

During the first instar, and growing progressively less throughout the later instars, is a tendency for the larvæ to congregate together on a leaf when feeding; small groups being found with their bodies touching along their length. Tender succulent food only can be eaten by the small larvæ, and in the case of cotton, the cotyledons form their first food.

When breeding caterpillars in the laboratory it was found necessary to cover the tops of the breeding jars with fine cloth when hatching of eggs was in progress, as the larvæ on emerging, immediately made for the top of the jar. After about two days this cover could be dispensed with as the larvæ normally did not again attempt to climb out of the jar, hiding during the day in the soil provided for them, or under cover of some débris on the bottom, and feeding during the night. For the rest of their larval lives, except in cases of disease or parasitism, the larvæ are positively geotropic and negatively heliotropic.

When feeding on cotton cotyledons the young larvæ feed on the underside, eating through to the upper epidermis, which, however, they often leave intact. The upper epidermis then sinks into the hollow space underneath, giving the characteristic pitted appearance of the work of young larvæ.

The second and subsequent instars up to the sixth, feed by night and hide by day in the soil, burying themselves deeper as they increase in size, and the bigger ones following the true "cutworm" habit of cutting through the stems of seedlings and pulling the leaves down to the ground for consumption. The younger stages usually leave the soil and climb on to the host plant to feed while the elder ones cut down the leaves and pull them into the soil, thus enjoying, even while eating, the protection which the soil affords.

At each moult there is a pre-moult cessation of feeding and period of rest, followed by the moult. The newly moulted larva has always a very light colour for some hours after moulting, but later becomes darker.

In all there are six instars, the duration of each according to temperature, being shown in Graphs II. and III.

The final instar larva grows to a greater size under cool than under hot conditions, and the moths from the larger larvæ have a larger egg capacity than from the smaller. The consequences of this will be considered in the general œcological discussion.

As the larvæ increase in size their capacity for food increases rapidly, so that the ravages of the pest soon become evident. On hatching the larva weighs only about ·002 grams and when full grown about 1·4 grams, an increase of 700 times, which argues a rapidly increasing power for destruction.

When the larva becomes full grown, it cuts its way into the ground, the depth varying with the hardness of the soil. In loose soil it goes to a depth of 3 inches and in hard soil from ½ to 1 inch. An earthen cell is built and the larva enters a resting pre-pupal stage.

No silken cocoon is spun, although it appears probable that some cementing material is used in building the walls of the earthen cell.

This cell has waterproof properties and a cohesive strength, due to the cementing material.

During the pre-pupal stasis the larva shrinks and slowly assumes the tapering shape of the pupa. The gut is cleared of fæces and there is a concentration of the protoplasm by the passing off of moisture.

The following tables show the daily loss in weight of full-fed larvæ during this stage:—

TABLE II.

Daily Loss in Weight of Full Fed Larvæ of *Euxoa radians* during Pre-pupal Stasis.

Series 1.

Date.	Weight in Grams.		
	Number 1.	Number 2.	Number 3.
1928.			
29th January	1·4	1·3	1·5
30th January	·85	·8	1·2
31st January	·67	·645	·74
1st February	·505	·55	·63
2nd February (pupated) ..	·39	·41	·52
3rd February	·39	·41	·46
4th February	·39	·41	·46
21st February	·39	·41	·46
	Emerged as adult moths, 21st February, 1928.		

Series 2.

Weight of five full-fed caterpillars = 6·2 grams 1·24 grams per caterpillar.

Weight of five caterpillars shrunken at pupation = 2·125 grams = ·425 grams per caterpillar.

Loss in weight, Series 1 = 70 per cent.

Loss in weight, Series 2 = 66 per cent.

Average loss in weight = 68 per cent.

Pupa.

When the pupa is fully formed under the old larval skin, there is a splitting of the latter along the dorsum of the thorax and the humped up thorax of the pupa protrudes. A rhythmic movement of the pupa then slips the exuvium caudad, and in this process the cremaster comes into play. At each upward movement of the tip of the abdomen, the hooks of the cremaster engage in the loose exuvium. The tip of the abdomen is then swung backwards and downwards, the hooked cremaster pulling the exuvium with it. The hooks then disengage, the tip of the abdomen is again raised for another pull, and so the exuvium is gradually brought clear of the pupa.

The pupal skin is a pale amber colour immediately after moulting, but darkens to a rich brown after a few hours. As pupal development proceeds the colour steadily darkens and when near completion the dark markings of the wings are discernible through the pupal skin, as also are the legs and haustellum. When development is complete the adult

moth emerges from the cocoon and pupal cell and flies off to recommence the cycle.

The times of development for each stage are fully dealt with in another part of this paper.

Seasonal Life History.

The individual life history having been dealt with, the seasonal life history can now be traced. The spring brood originating from the over-wintering parents has been most destructive in the cotton areas, about October. In November and early December there is sometimes a recrudescence of damage from the second brood of the season, but the mid-summer brood is seldom very destructive unless conditions are particularly favourable to the species.

On the coastal areas damage may occur all the year round, even in winter, but west of the coastal range where severe frosts are experienced, damage does not occur in the winter months. Moths have been captured during each month of the year on the coast, and in favourable areas inland breeding is continuous, although a dragging out of the life history in the cold season takes place.

Broods are continuous throughout the year, except that in the winter months only the pupæ in the ground survive in areas of severe frosts, as not only are the larvæ which may be present checked in development, but their food plants are killed off. It so happens that no feeding stage can persist in a severe winter, but the pupæ in the ground survive. The pupal instar is lengthened, but there appears to be no periodicity about it, only the direct effect of continuous reaction to temperature. This lengthening of the pupal instar allows it to be carried over until rising temperatures and spring showers bring out both itself as adult moth, and host plants to support its offspring.

The length of life of *Euxoa radians* from the hatching of an egg to the time when the caterpillar has become an adult female moth, mated, and laid eggs, is shown below:—

At 20 deg. C.	about 106 days
At 25 deg. C.	about 65 days
At 30 deg. C.	about 52 days

The proportion of males to females is about even. In one group, emerging from the pupal stage November and December, thirty-nine were males and thirty-seven females.

[TO BE CONTINUED.]

INQUIRIES CONCERNING PARASITES.

DIRECTIONS TO STOCKOWNERS.

By F. H. S. ROBERTS, M.Sc., Veterinary Entomologist and Parasitologist.

1. Internal Parasites—Worms.

(*a*) The specimens should be forwarded in spirits or formalin. A 10 per cent. solution of formalin is preferred. This may be prepared by adding three volumes of water to one volume of commercial formalin. On no account should the specimens be sent in water only, as the worms will quickly decompose without any preservative.

(*b*) When possible a number of specimens should be sent in order that both males and females be represented.

(*c*) Care should be taken in packing the container for postage. The postal regulations specify that sufficient packing be used to absorb any liquid that may escape through the container leaking or being broken.

(*d*) Accompanying the specimens full particulars of the following should be forwarded:—(1) The name of the animal in which the parasites were found; (2) the locality and date; (3) the nature of the country on which the animal had been accustomed to feed; (4) the name of the internal organ infested, whether the lungs, stomach, intestine, liver, &c.; (5) whether the parasite was lying free, attached, or in nodular form; and (6) the condition of the animal affected.

2. External Parasites—Flies, Lice, Fleas, Mites, and Ticks.

Flies.—(*a*) When a good series is obtainable, some specimens may be sent in spirits; the remainder in small boxes packed securely in position with cotton wool and soft paper (tissue paper). If only one specimen is forwarded it should be packed in cotton wool or tissue paper. Care should be taken in packing the specimen securely to prevent any movement, as this would tend to destroy bristles and other small structures useful for the identification of the species. Maggots should be sent alive packed in sawdust or cotton wool, the packing being slightly damped.

(*b*) Fleas, mites, and lice are best forwarded in spirits.

(*c*) Ticks are preferred alive, though if necessary they may be sent in spirits or formalin. Partly engorged and unengorged specimens are preferred. The males are required and these are usually to be found wandering about in the vicinity of engorged and attached females. A good series of specimens representing both adults and young is desired. Care should be taken in detaching ticks as headless specimens are useless for identification purposes. A small drop of kerosene applied to the tick will cause it to fall off the host in a very short time. A good steady and patient pull will also yield good results.

(*d*) In all cases the host, locality, type of country, and part of animal infested should be noted.

THE MARGOSA TREE AND ITS ALLIES.

By C. T. WHITE, Government Botanist.

Considerable attention has been directed recently to the possible use of the oil from the seed of the Margosa tree as a general insecticide and germicide, particularly in relation to the blowfly pest in Australia, so a few notes on it may not be without interest.

Azadirachta indica is a native of Ceylon and India. In the former country it seems to be universally known by its Portuguese name of "Margosa," and the oil from the seed is held by the natives in great repute as an external application for sores, rheumatism, &c. It is a tall tree allied to our White Cedar, and in India and other parts of Asia is widely planted as a shade and ornamental tree. It is not found wild in Australia, and I do not know that it is to be seen growing in any Australian gardens, though it would seem strange if it has not been introduced. It is possible it is growing in some places and has been passed by as an ordinary White Cedar.

The tree is sometimes known as *Melia Azadirachta*, but most botanists now keep the genus Azadirachta as distinct from Melia, though the distinctions are but slight. As at present understood the genus consists of but two species, *Azadirachta indica* of India and Ceylon and *A. integrifolia* of the Philippine Islands.

Melia azedarach, of which our White Cedar has been considered by some botanists to be merely a variety as now understood, is considered to be confined to Northern India, Persia, and China. It is commonly known as the Indian or Persian Lilac or Bead tree.

Melia dubia is the name now generally accepted for the White Cedar of the rain-forests (jungles, brushes, or scrubs) of coastal Queensland and Northern New South Wales. In addition to Australia, however, it has a wide distribution through tropical Africa, tropical Asia including Southern China, Formosa, and the Philippines through the Malay Archipelago and New Guinea to Australia.

The tree is sometimes known as *Melia composita*, but the specific name *dubia* has nearly forty years priority. As mentioned above the Australian tree has been considered a variety of *Melia azedarach* and named *Melia azedarach* var. *australasica*, though it would seem preferable to keep it as above outlined. The seed is not known to contain any oil, but the matter is one worthy of investigation.

APPLICATION OF SCIENCE TO AGRICULTURE.

By PROFESSOR A. E. V. RICHARDSON, M.A., D.Sc., Director, Waite Agricultural Research Institute.

In an address delivered to the Australian and New Zealand Association for the Advancement of Science, Brisbane, 2nd June, 1930.

The meeting of the Australian and New Zealand Association for the Advancement of Science in the Capital City of a State with such vast agricultural and pastoral resources as Queensland formed an appropriate occasion for discussing the importance of the primary industries to national welfare, and the desirability of developing these industries to the utmost extent attainable.

The discussion of this question is appropriate because the agricultural community is being urged on all sides to increase the production of exportable commodities in order to alleviate the financial difficulties which are temporarily confronting the Commonwealth.

In this paper Dr. Richardson demonstrates the relationship of scientific research to the development of agricultural practice, and how further development in these industries depends upon the application of scientific knowledge.

IMPORTANCE OF AGRICULTURE.

THE agricultural and pastoral industries provide the food supply of the nation, the raw materials of the manufacturing industries, and are the pillars on which the prosperity of the Commonwealth rests. The total value of production from all sources in Australia, according to the 1927 Year Book, was £430,000,000 sterling, of which the primary industries, excluding mining, contributed £262,000,000, or roughly 60 per cent.

But, quite apart from its material importance, the agricultural industry has a special significance to national life. Agriculture is one of the great permanent industries. As Sir Robert Grieg states, "Coal seams come to an end, and the discovery of new sources of energy changes the value of coal. Advances in physical science may, by creating new industries, destroy old ones. Gold, silver, copper, and lead mines have a relatively limited life in the history of the nation, and every ton of ore raised leaves the mine so much the poorer. But agricultural wealth, the capacity to produce every year the food and clothing without which life ends, always has been and always will be the foundation of national and world wealth."

Moreover, the conditions of country life are peculiar in their contribution to health, their stimulus to personal initiative, and their fostering influence on that spirit of individualism on which rest free institutions and democratic government. Rural populations exert an important influence in the mental outlook and physical vigour of the race.

Furthermore, the business of farming, dealing as it does at every step with the subtlest laws of nature, is capable of indefinite improvement as soon as and as rapidly as the findings of science are applied to its affairs.

Agriculture has been referred to as the oldest of the arts, and the most recent of the sciences. In the older countries of the world agriculture has been an art based upon experience and handed down from father to son by tradition. Even to-day a considerable part of what the farmer needs is practical experience, but the other part—the scientific side of his business—is becoming more and more important. If we are to keep pace with the progress of agriculture in other countries, agricultural science must subtend an ever widening angle to agricultural practice.

Finally, agriculture is an enormously productive industry, and money expended on its development by research and education gives a liberal return on the investment. Every day in the year the aggregate production of new wealth from the soil in Australia exceeds £500,000 sterling, or nearly £200,000,000 sterling per annum. If, through the promulgation of better methods of feeding and breeding dairy stock, the production of butter fat could be increased by the small amount of 10 lb. per cow, it would mean an increase in annual production of approximately £2,000,000 sterling. Each bushel of wheat added to the wheat yield of Australia results in a permanent

addition of £3,000,000 to the national income. Every pound of wool that can be added per sheep by improved nutrition or elimination of pests, would add at least £5,000,000 per annum to the national income. Every insect and fungus pest we learn to control adds enormous wealth to the Commonwealth.

It is because of the recognition of the unique importance of agriculture to the national welfare that other countries, notably the United States of America, Canada, and South Africa, and more recently Britain, have established and maintained at national expense institutions for fostering research and development in agriculture.

If the development of agriculture were merely the concern of the farmers, they might be left to provide it for themselves. But in the final analysis, the development of agriculture is of national importance, and public funds are therefore freely appropriated by these countries for its orderly development.

The public support of scientific research in agriculture on all these grounds should, therefore, be accorded freely with understanding and with patience. This is the era of the application of science to industry, and its triumphs have been witnessed in our time in the remarkable development of transport, aviation, wireless, engineering. The era of the application of science to agriculture is fast approaching, and when it comes the returns will be vastly in excess of the money invested in it.

SCIENCE AND PROGRESS.

Before considering the possible results of the application of science to agriculture, let us consider briefly the bearing of science on human progress and industrial development.

> "The progress of civilisation very largely depends on the development of science and its application to all phases of life—to the everyday problems of education, health, transport, housing, land settlement, and agriculture. If substantial progress is to be made in these fields it can only be along a road of which the foundations have been laid by scientific thought and research."—H.R.H. the Prince of Wales, B.A.A.S., 1926.

"Real progress," said Sir William Ramsay, "consists in learning how better to employ energy, how better to effect its transformation."

The achievements of science in this direction have enormously increased the productive power of men, and have lessened human drudgery. The development of the steam engine, the gas engine, the internal combustion engine, the electric dynamo, the utilisation of electric energy in manifold forms, the harnessing of the energy of falling water and its conversion into electrical and other forms of energy, and the concentration of chemical energy in explosives have immensely increased man's power over nature.

The great revolutionary changes in our industrial life—the great inventions which have altered the character of our civilisation—have arisen not as an effort to achieve results of immediate practical importance, but as a result of patient and persevering pursuit of knowledge for its own sake.

The invention of the electric dynamo was rendered possible only by the researches of Faraday, who revealed how the armature of a magnet swung round mechanically in a magnetic field and gave rise to an alternating current of electricity.

The X-ray tube arose as a result of the investigation of the nature of the electric discharge in gases, and not as a result of consciously directed effort to discover a means whereby we might, as it were, see through a brick wall or examine the internal structure of the living body.

The invention of the thermionic valve which led to the recent remarkable development of wireless, and the linking up of London and Melbourne by the wireless telephone, was rendered possible only by previous researches on the emission of electrons from hot bodies.

In the domain of biological science and preventive medicine, the achievements have been equally remarkable.

It was Pasteur who said that "In our century science is the soul of the prosperity of nations, the living source of all progress. What really leads us forward are a few scientific discoveries and their applications."

The work of Pasteur, indeed, is a striking exemplification of his own statement. His classical researches and discoveries on the cause of fermentation inaugurated a new era in the wine-making, brewing, and dairying industries, because he was the first to establish a controllable cause for fermentation and putrefaction, and for the diseases of wine, beer, and milk, which had from time immemorial baffled all attempt at cure.

The application of Pasteur's discoveries on putrefaction and fermentation to surgical operations at the hands of Lister revolutionised surgical practice, and banished for ever the torture of gangrenous wounds from the surgical wards of our hospitals.

The pébrine disease which first attacked the silkworms of France in 1849 caused the annual revenue of the silk industry to fall from 130,000,000 to 8,000,000 francs. The silk industry was ultimately saved by his scientific labours, for he was able to establish the cause and method of control of the disease.

Pasteur gave us the first definite knowledge of the bacterial origin of disease, and the production of immunity by vaccines. His application of this principle to the control of anthrax and hydrophobia was the culminating glory of his life.

Koch, in 1876, had shown how to isolate the organism of anthrax and cultivate it in pure culture outside the body. Pasteur confirmed these results and made an even more important discovery, namely, that by growing successive and continued artificial cultures the virus or poison of the organism became weakened or attenuated, and that if this weakened virus or poison is injected into the animal only a slight attack of the disease occurs and the animal is rendered immune from further attacks. The virus becomes a vaccine.

Many millions of sheep and cattle have since been treated for anthrax all over the world, and the rate of mortality has been reduced to less than 1 per cent.

As to the money value of these discoveries, Huxley has estimated that it was sufficient to pay the whole cost of the war indemnity paid by France to Germany in 1870.

The Pasteur Institute was founded as a national memorial to the illustrious man whose name it bears. That restless, tireless genius had saved France millions in treasure, and hundreds of thousands of lives. The silk industry, wine industry, dairying industry, stock-raising industry, medicine and surgery had felt the impress of his mighty hand.

Scorning the rich rewards which might have been his had he chosen to patent his discoveries, Pasteur deserved well of his country. The people understood and honoured him as few men have been honoured while they were alive. When one of the great newspapers opened a subscription list for a splendid memorial for an institution wherein Pasteur and his disciples might carry on their work under the most favourable conditions, the response was instantaneous. There was hardly a humble home in France which was not indebted in some way to Pasteur—there was hardly a home from which a subscription did not come. The wonderful Pasteur Institute was the result. Research workers come there now from every part of the world, and while the work of the Institute is now highly technical, it may perhaps be said that nowhere has so close an approach been made to the solution of the most intimate problems of hygiene, health, and of life.

Scientific research is not a luxury. From the purely materialistic point of view it is probably the cheapest form of investment that can be made. Germany in the nineteenth century provided a classic illustration of the manner in which a country, comparatively poor in natural resources, can, by the organised application of scientific research, grow rapidly in wealth and power.

When Schleswig-Holstein was torn from Denmark the Danes developed their systems of education and agricultural research with such success that they have become the world's object lesson in agricultural advancement.

Sir Richard Gregory, at the Capetown meeting of the B.A.A.S., said that "creative science, purposeful invention, and skilful labour are the three legs of a tripod on which industrial development rests. There can be no stability unless each foot stands firmly on the ground of common interest, and each bears its share of the structure supported by the combination. Without this triple alliance of the scientific investigator, alert manufacturer, and skilled operative, no nation can expect to be in the van of modern progress."

We are living in an age of rapid change and ever-growing complexity, and any industry or any country that is content to stand still is quickly left behind in the march of progress.

SCIENCE AND AGRICULTURE.

The foundations of agricultural science were laid long before governments took any part in its development. They were laid by men who pursued research for the love of knowledge—by such men as Liebig, Lawes, Kuhn, Pasteur, Mendel, Hellriegel, and many others. The past triumphs of agricultural research are familiar to many

of you, but in a gathering of this nature I may be pardoned if, for purposes of illustrating their economic bearing, I give a few examples of the far-reaching effects of the scientific discoveries of the chemist, the biologist, and geneticist.

The first great triumph was the introduction of artificial fertilisers, notably superphosphate, sulphate of ammonia, nitrate of soda, and potassic salts. These have added greatly to the productiveness of soils all over the world, and increased the output not only from crops but also from grasslands.

Superphosphate is of special interest to us because of the general deficiency of our soils in available phosphoric acid, and the extraordinary response which soluble phosphates give on wheat and grass lands.

Liebig was the first to draw attention to the fact that the insoluble tribasic phosphate in bones and rock phosphate could be converted into water soluble phosphate by treatment with sulphuric acid. In his report to the British Association in 1840 he suggested that this would be a suitable form in which phosphoric acid might be applied to crops.

Sir John Lawes, of Rothamsted, was one of the first to profit by this discovery, for he not only tested the efficacy of dissolved bones on his famous experimental plots, but began the manufacture of superphosphate from rock phosphate in 1842, and thus laid the foundation of the large fortune which he subsequently made and devoted to agricultural research. He established the Rothamsted Agricultural Experiment Station, one of the oldest and most famous agricultural research stations in the world, and left £100,000 for its endowment.

Since then the practice of using superphosphate has spread to every agricultural country. In no part of the world are phosphates so universally used as in Australia. Soluble phosphates are of special value to Australia, partly because of the common deficiency of Australian soils in phosphates, but also because it has been demonstrated that the application of soluble phosphates lowers the transpiration ratio and the water cost of producing dry matter in cereals and pasture plants, and thus increases the effectiveness of a limited rainfall.

The economic results to Australia of this simple discovery are difficult to assess, but for the wheat crop alone it is safe to say that its general use has increased the average yield of Australia by at least three bushels per acre—an increase worth annually £7,500,000 sterling to the Commonwealth.

Nitrogenous fertilisers are essential for the growth of crops and grassland in regions of heavy rainfall. In 1898, at the British Association for the Advancement of Science, Sir William Crookes predicted that the supply of natural nitrogenous fertilisers would soon become exhausted, and suggested the possibility of manufacturing these from the inexhaustible supplies of nitrogen in the air. Synthetic nitrogenous fertilisers are now manufactured in enormous quantities in Germany and Britain, and are being extensively used for intensifying producton from grasslands in Europe.

Pasteur's Work.

The achievements of Louis Pasteur have already been referred to. Some of his most fundamental and far-reaching studies had their roots in agricultural problems, and few men have had a more vital influence on the development of science in relation to agriculture. It is only necessary to recall his studies on fermentation in wine and vinegar making, on the serious troubles of silkworm culture, and on the several diseases of live stock, from which resulted some of his most epoch-making advances in science.

In discovering the cause and method of control of the deadly anthrax in stock he made one of the most fundamental additions to the etiology of disease; and in staging an extensive and successful experiment on anthrax under the auspices of the Melun Agricultural Society he compelled universal acceptance of his theory of protective vaccination, one of his greatest triumphs. His work on fermentation and on diseases of stock led to epoch-making contributions to bacteriology and immunology, and opened up a new world in combating infectious diseases.

Mendel's Law of Inheritance.

In 1865 Gregor Mendel, a monk of the Monastery of Brünn, in Austrian Silesia, formulated a law of inheritance which may be regarded as one of the greatest of biological discoveries. By his classical researches on the garden pea he was able to

show that when two distinct types of plants were hybridised the unit characters of each species were independently inherited, and that this was brought about by a segregation of the germ cells carrying the characters. Later researches have demonstrated that the chromosomes of the germ cells are the carriers of these heritable factors—the so-called genes of the biologist.

The presence of a small number of factors or genes carried with it the possibility of an enormous range of variation. Thus, with ten pairs of characters, there would be no less than 2^{10} or 1,024 distinct pure breeding forms produced by hybridisation, all of which could be isolated and raised in pure culture. Thus the almost infinite variety in Nature could be accounted for by assuming the presence of a comparatively small number of genes in the parent germ cells.

The Mendelian conception of unit characters, based on specific factors, transmitted in accordance with a definite scheme of inheritance, provided a scientific basis for breeding and a starting point for the modern science of genetics. By the recombination of the desirable characters contained in several varieties of the same species of plant, the plant breeder is now able to produce improved varieties of farm crops with a reasonable degree of certainty.

The principles have been applied with marked success with many varieties of crop plants, especially with wheat, and it is safe to say that the application of Mendel's principles to wheat breeding has added millions sterling to the wheat fields of the world, and has pointed the way to the ultimate production of varieties resistant to disease.

One of the earliest and most successful wheat hybridisers was William Farrer, of New South Wales, who, working in the Federal Capital Territory, produced Federation and many other prolific varieties of wheat. The Federation variety became so popular that Farrer may be said to have changed the colour of the Australian harvest fields from golden yellow to dull bronze—the colour of his own Federation wheat. The work of this pioneer wheat breeder, whose monument is to be seen in nearly every ripening wheat field of Australia, has resulted in increased production amounting to millions of bushels annually.

Similarly, the production of Marquis wheat in Canada by Dr. Saunders has revolutionised wheat culture in Canada, and it is estimated that the increased production of wheat in Canada due to this variety amounts to millions sterling per annum.

The mantle of Farrer has fallen on others, and thanks to their efforts almost the entire wheat belt of the Commonwealth is now sown with varieties which were unknown to the wheatgrowers a generation ago.

Breeding for Disease Resistance.

Apart from its application in the production of new and prolific varieties of wheat, there is reason to believe that the problem of producing disease-resistant types of crop ultimately will be solved by further applications of the Mendelian principle of inheritance.

An interesting illustration is the production of rust-resistant wheats. The estimated damage due to rust in the United States in 1916 was £60,000,000. In the same year the loss in New South Wales was estimated at £2,000,000. Careful research has established the fact that there are a large number of physiologic forms of rust. Stakman and others have shown that there are no less than fifty-five distinct biologic forms of rust, and that certain varieties are immune to some forms of rust and susceptible to others. Of these species of rust Australia has six indigenous forms, and one form which has been found in other countries.

Dr. Waterhouse, of Sydney University, has shown that the variety Thew was resistant to three of these biologic forms, whilst another variety, Canberra, was resistant to the remaining three. By crossing these two varieties he was able to produce a new variety, Euston, which was resistant to the six indigenous strains of rust. An American variety, Webster, was shown to be completely resistant to the introduced species of rust, and crosses between Euston and Webster have been made which now promise to be completely immune from the seven species of rust now found in Australia.

The problem of breeding rust-resistant varieties in Australia is much simpler than in other countries because of the comparatively few biologic forms of rust. The solution of the problem of rust-resistant varieties of wheat for Australia appears to be within sight, thanks to the patient research work of Dr. Waterhouse.

The Artificial Transformation of the Gene.

Most geneticists will agree that mutation forms the chief basis of evolution. Mutations have been a fertile source of improved races of plants. The history of the domestic cabbage and its cousins may be taken by way of illustration. When Linnaeus classified the plants of the world he gave the same specific name to the cabbage, cauliflower, kohl rabi, kale, Brussels sprouts, and to a wild plant inhabiting the Mediterranean region—namely, *Brassica oleraceæ*. The origin of these various forms of *Brassica oleraceæ* is not known, but there is little doubt that they arose from a common progenitor somewhat similar in type, but more mutable in character than the wild type of the Mediterranean.

All vegetative parts of the original species were evidently highly variable and mutable, for the cauliflower arose from a change in the inflorescence, the cabbage from a change in the leaf. Similarly, the mutation of the leaf buds, stem, and root produced respectively the Brussels sprouts, the kale, and the khol rabi. These mutations, as they appeared, were seized upon by man and perpetuated by cultivation.

Unfortunately, these discontinuous variations, or sports, caused by the mutations of the gene, occur with extreme infrequency under ordinary conditions. Hence the practical breeder has to be content with the recombination of the unit characters in his plants and animals by hybridisation or crossing, supplemented by an occasional mutational windfall, which gives him a basis for further development. There has been a widespread desire on the part of biologists to gain some measure of control over these mutational changes, and even to induce them artificially.

Quite recently Dr. H. Muller, of the University of Texas, appears to have demonstrated that in Drosophila gene mutation could be brought about by relatively heavy dosages of X-rays. Several hundred mutants were obtained in this species by this means, and they have proved to be stable in their inheritance for at least three generations.

Comparison of the mutation rates of irradiated and control Drosophila showed that in one case the mutation rate under irradiated conditions was 15,000 per cent. greater than in the untreated controls. Just what has taken place in this interesting experiment is difficult to say without further investigation, but if the X-rays has brought about the artificial transmutation of the genes—the bearers of heredity—and if it can be shown that gene mutation in plants or domestic animals can be induced by similar methods the economic importance of the discovery can hardly be overestimated.

Control of Fungus Pests in Plants.

From time immemorial the cultivated crops have suffered from the ravages of fungus pests. Every country had a few, and with improvement in transport diseases were liable to be carried from one country to another. Moreover, under cultivation plants were more liable to disease than in the wild state.

The most destructive crop disease in the history of mankind was the ordinary potato blight (*Phytophthera infestans*). This was a native of South America and when it first reached Ireland, in 1840, it swept the country with all the vigour of a new pest, and caused widespread famine throughout Ireland. Once the disease appeared the farmer was helpless; there was no cure in sight. As Sir John Russell has said, "Of all the tyrants Ireland ever had the potato blight was the worst; it cost thousands of lives, untold suffering and misery, and millions in money." The life history of the fungus was worked out and a simple remedy was found—the spraying of the crop at appropriate periods with Bordeaux mixture—and now the blight is rarely heard of.

The "Smut" disease which has ravaged the wheat crop throughout recorded history was brought under control as soon as Kuhn, in 1858, showed that the fungus infection took place at the seedling stage, and that the smut spore adherent to the grain, but not the grain itself, was killed by a moderately dilute antiseptic. Now the wheatgrower secures complete immunity by pickling his seed with bluestone, formalin, or copper carbonate, at the cost of a few pence per acre.

Insect Pests in Plants—*Phylloxera*.

The dreaded phylloxera disease broke out in the Bordeaux district of France in 1863, and in less than twenty years the disease had spread so rapidly that the total damage done was £400,000,000—twice the indemnity paid by France in the Franco-Prussian war.

From France it spread through Europe, Africa, and finally to Australia. It broke out in Geelong in 1877, Bendigo and Rutherglen in 1898, and wiped out 30,000 acres of vines in Victoria, worth £2,500,000 to Victoria.

The French Government sent a scientific commission to America to study the pest in its native habitat. After prolonged investigation this Commission demonstrated that—

(1) While the phylloxera insect caused galls on the leaves of the indigenous American vines, it did not in any way affect the roots of the vines.

(2) The phylloxera did not attack the leaves and stems of the European vines, but completely destroyed the root system.

(3) Hence if the European vines—the fruit of which was so valuable for wine making and table purpose—were grafted on the roots of American species, the resultant plant would be immune from the attack of the phylloxera.

After much careful research work, involving years of trials of American root stocks, a species of Rupestris vine was selected as the best stock. The vineyards of France and Europe were reconstituted with these phylloxera-resistant stocks, and phylloxera is no longer a menace. The whole of the Rutherglen district has been replanted with phylloxera-resistant stocks, and experience has shown that the grafted vines are absolutely immune from attack and thrive and yield well in the phylloxerated soil.

Biological Control of Prickly-pear.

The spread of prickly-pear in Queensland affords the world's greatest example of the invasion of a plant pest or noxious weed, and a most interesting experiment on biological control of plant pests on a grand scale.

Prickly-pears were brought to Australia by the early colonists without their natural enemies, and remained exempt from injury by native insects. They therefore spread with amazing rapidity in their new environment. In 1925 the pear menace probably reached its climax when 60,000,000 acres of more or less fertile land in Queensland and New South Wales was infested with the pest.

There is no need to detail the efforts which Queensland has made in attempting to rid its land of this menace. Various methods of control have been tried—its eradication by mechanical means, by chemical agencies such as poisonous sprays, and by biological means—the use of insect and fungus enemies of the pear. The most hopeful is the method of biological control.

In 1919 the Governments of the Commonwealth, Queensland, and New South Wales agreed to co-operate in investigating the possibilities of applying methods of biological control. The Prickly-pear Board was established to undertake this work. The first step was to search the cactus world for all types of parasites and predators, import them, and acclimatise them, and test them against crops and other plants to prove that they would not be harmful to plants other than the Opuntias. After demonstrating the value of these pests as destroyers, the next step was to breed them on an enormous scale and distribute them.

A large number of promising pests have been introduced, acclimatised, and tested under great difficulties. Among these the caterpillar of a brown moth with the euphonious name of *Cactoblastis cactorum* has proved most successful and destructive. Its advent has justly given rise to great optimism. Over 2,000,000,000 eggs of this parasite have been liberated in the prickly-pear belt, and on present indications, it would appear probable that vast areas of prickly-pear land will be reclaimed by *Cactoblastis* and other insects. It is to be hoped that native parasites or disease epidemics will not impair the efficiency of these introduced predators.

The Prickly Pear Board and the Prickly Pear Land Commission, who are responsible for the scientific and administrative work, are to be congratulated on the progress that has been made, and if, as seems probable, complete control by these biological agencies is ultimately achieved, an area of land as large as England will have been reclaimed, and a scientific principle of the highest practical significance will have been demonstrated.

Intensive Sugar Production.

In Java science has been applied to intensive crop production with amazingly satisfactory results. The Dutch Government maintains a large Department of Agriculture with strong scientific branches, but in addition there are many private research institutions conducted for each of the more important estate crops, sugar, coffee, tea, rubber, and tobacco.

The sugar industry was the first in Java to seek scientific assistance, largely because of the appearance of the "Sereh" disease towards the end of the last century. The famous sugar experiment station, established by the sugar-growers

at Pasoeroan, in Eastern Java, affords a remarkable illustration of the manner in which a research institution can assist a staple industry. The sugar growers levy a rate of 4s. 9d. per acre on every acre under cultivation for the research work at Pasoeroan. This brings in an annual revenue of £120,000. The station has a large scientific staff of first-class men engaged on agronomic, chemical, botanical researches on all phases of sugar-cane production. Probably nowhere in the world is there such an example of primary producers supporting fundamental scientific research work on such a large and imposing scale as at Pasoeroan.

That the work of the station has been successful is shown (1) by the heavy levies willingly given for a quarter of a century—this shows that the growers have faith in the value of scientific research—(2) by the results achieved. Since the establishment of the research station in 1890, the area under sugar-cane has more than doubled and the yield per acre, notwithstanding the extension of sugar culture to much poorer land, has been increased from 70 to over 120 quintals per hectare—i.e., an increased yield per acre of 70 per cent. In other words, the total production of sugar has more than trebled in forty years. Forty years ago the whole area was planted with Black Cheribon, but this has been succeeded by improved varieties bred by the institute. The latest and greatest triumph is a prolific variety of high sugar quality and possessing great powers of resistance, known as 2878 POJ, which promises to displace all other cultivated varieties. The production of this variety is a genetical triumph, for it was produced by hybridising the cultivated cane with a wild species or glagah (*Saccharum spontaneum*), which contains a different number of chromosomes from the cultivated species.

REFRIGERATION.

The application of the principle of refrigeration to the carriage of perishable produce opened up a new era of progress for Australia. The first shipment from Australia was made in the "Strathleven," in February, 1880, with 34 tons of beef and mutton. Since then the development of refrigerated shipping has rapidly developed and now the average annual export of beef, mutton, lamb, dairy products, and fruit exceeds £15,000,000 sterling.

Much scientific work is being done at the Low Temperature Research Station at Cambridge to further improve the conditions under which the carriage of refrigerated meat and fruit is conducted. Australia has made a substantial contribution to the problem of carriage of apples by showing that the bitter pit of apples, which has been responsible for heavy annual losses, is caused by packing the fruit in an immature condition. Much work remains to be done to determine the best stage of maturity to harvest the various fruits, and to determine the most favourable conditions of temperature, humidity, and methods of ventilation of the fruit in the hold of the ship to eliminate disorders of the fruit due to transport. Eventually these problems attending the transport of fruit overseas will be solved, in which case a new era of prosperity will be ushered in for our fruit industries.

AGRICULTURAL MACHINERY.

The farmer has been greatly aided by the development of labour-saving machinery. A century ago it took a man 3½ hours to cut with sickle and thresh with flail a bushel of wheat. To-day the same work is done with a combined harvester in less than three minutes.

The modern harvester is the most efficient, labour-saving and economical machine yet developed for handling cereal crops, and its introduction has greatly increased the efficiency of labour at harvest. Australia is one of the few countries in which the climatic conditions permit this machine to be used with advantage, and it is largely owing to this fact that our wheat growers, although 11,000 miles from their market, can compete with the world in economic wheat production.

Babcock Butter Fat Test.

In 1890 Dr. Babcock, of the Wisconsin University, discovered a simple method of determining the butter fat content of milk. The principle of the method was that the casein of the milk was dissolved by concentrated sulphuric acid, and that the fat could be separated from the milk by centrifugal force. He devised a simple piece of apparatus which enabled the dairyman to find the butter fat content of milk in a few minutes. This simple discovery has meant much to the dairying industry. Not only has it enabled butter factories to use an exact method of payment for milk and cream, in accordance with the quality of the product, but it permitted a more careful control over factory processes than formerly, and resulted in an enormous saving of butter fat formerly lost in skim milk.

Moreover, the Babcock test provided the means whereby the dairyman could detect the unprofitable animals in his herd, and thus provided a scientific basis for herd testing. How much improvement was possible in this direction may be realised from the fact that whilst the average production of butter fat per cow in Australia is about 160 lb. per annum, Melba XV. of Darbalabra produced, in an official test, 1,614 lb. of butter fat from 3,252 gallons of milk—a tenfold increase over the average production for Australia.

LIMITATIONS OF AGRICULTURAL RESEARCH.

These are a few of many illustrations which might be given of the direct way in which scientific research has assisted primary production. But having stated a few outstanding cases, I must now hasten to give a word of caution. Scientific research applied to agriculture involves the patient and painstaking examination of agricultural problems, and its processes are necessarily slow. The non-scientific public is accustomed to view science as it might a volcano—prepared for the eruption of some new discovery from time to time, but accepting the effects of the eruption without realising the processes which led up to it during the previous period of quiescence. The period of preparation by research before science can offer to the world some new discovery may be long, but the scientific machine is always quietly running in the laboratory.

Moreover, agriculture differs from other industries in which a new discovery may be followed by a sudden transformation of the old. Agriculture is an age-old industry, slow-moving and conservative. The agriculturist deals with biological processes—with the production of plants and animals—and processes of production cannot be speeded up. As Sir Daniel Hall has said, "It still takes a wheat plant six or nine months to develop, and cows bring forth their calves neither more quickly nor more numerously than they did in the days of Abraham."

These limitations lie in the nature of the materials with which agriculture works, and though agriculture owes much to the application of science, we must not hope for revolutionary changes such as those witnessed in aviation and wireless. The life cycle of animals runs into years, and even in cropping a rotation of years must often be followed to get the full effects of any change of method. Hence the results of agricultural research are absorbed almost imperceptibly into agricultural practice unless the agricultural educational methods are well organised and thorough.

APPLICATION TO MAJOR PRIMARY INDUSTRIES.

A few illustrations have been given of the manner in which science and invention have assisted primary industries. We may now consider the manner in which scientific research may be applied in the development of our major primary industries. Broadly speaking, there are two ways by which primary production may be increased —firstly, by increasing the acreage under crop or carrying stock, i.e., by extending the margin of cultivation into drier areas; secondly, by increasing the efficiency of production within the areas at present in use by improving the output per acre and per animal.

In all States Governments have attempted to increase the agricultural output by bringing new lands under cultivation in areas of light and uncertain rainfall. This has involved heavy capital expenditure for roads, railways, water supply, and heavy loan expenditure for financing the settlers to establish themselves and to provide the expensive plant necessary for cultivation. It is doubtful whether much of this expenditure has been justified economically, taking into account the high capital costs involved in providing the necessary facilities and the low average returns secured.

The alternatve method of increasing production is by increasing the efficiency within the existing settled areas by increasing production per acre and per animal by the application of existing knowledge and the discovery of new facts which will enable further intensification of production to be brought about. The common task throughout the world is to wrest from reluctant Nature all that Nature can be made to yield. To increase the output from agriculture involves the intensification of production, and this can be done by *research* on the one hand and *education* on the other.

It is a matter of common observation that a wire fence often separates the grower of a 30-bushel wheat crop from the grower of a 10-bushel wheat crop. This difference in production is not due to difference in the productivity of the soil, but to differences in the skill and applied knowledge of individual farmers. In a recent survey of one of the richest dairying districts in Australia it was found that on almost identical soil some dairy farmers were securing 250 lb. of butter fat per cow, whilst their neighbours obtained less than 80 lb. per cow. Here again the differences in production were due not to fertility of the soil but to different skill of the farmers in the breeding, feeding, and management of the dairy cattle.

One of the great tasks of the Agricultural Departments of the State is to induce the many to do what the few are actually doing to-day. In other words, to induce the careless or indifferent growers to use the approved methods of cultivation which the majority of successful farmers now employ.

No matter from what angle the problem of agricultural education and research be viewed, it resolves itself ultimately into the problem of providing a sufficiency of agricultural specialists, investigators, and extension workers and using them in an organised scheme of research and education. This is the clear and unmistakable lesson to be learned from the efforts of other countries in their work of stimulating agricultural ddevelopment.

Trained research workers are needed for the investigation of the principles underlying the successful cultivation of crops and the feeding and management of live stock, and the principles underlying the control of diseases of crops and live stock. Trained and tactful extension workers are also required to get into close personal touch with those whose farms and animals are giving mediocre yields. This extension and educational work in agriculture is, and should be, carried out by the State Departments of Agriculture.

WHEAT, WOOL, AND DAIRYING.

The three great primary industries of the Commonwealth are wool, wheat, and dairying. A substantial increase in production could be brought about if the majority of cultivators could be induced to follow the methods practised by the most progressive farmers and pastoralists.

Wheat.

Take the wheat industry as an example. The wheat yield of South Australia for the period 1916-1926 was 12.44 bushels per acre, as compared with an average yield of 4.74 bushels per acre for the decade 1892-1901, notwithstanding the fact that the area under crop has been increased by over 50 per cent. by bringing under cultivation land in regions of light rainfall.

Similarly, in Victoria, the average yield for the same period has increased from 7.65 to 14.40 bushels per acre, an increase of 100 per cent. During the same period the area under cultivation in Victoria has been extended by the development of land in the drier mallee areas.

In the Wimmera district of Victoria the average yield during the same period has increased from 7.08 bushels per acre to 20.9 bushels per acre—i.e., it has been nearly trebled. Somewhat similar progress has been made in Western Australia and New South Wales.

In all Departments of Agriculture much research and extension work has been done in wheat. The main principles underlying successful cultivation of wheat have been worked out, but the standard practices suggested by this work are far from being carried out by the majority of the wheatgrowers.

The actual returns obtained by 12,738 wheatgrowers in South Australia for a normal season, 1926-27, averaged 12.87 bushels per acre. One thousand five hundred and thirteen farmers reaped less than 6 bushels per acre, less than half the average of the State, and 303 farmers reaped less than 3 bushels, or one-quarter of the average yield of the State.

On the other hand, 1,458 growers obtained an average of 24.6 bushels per acre, and 81 over 36 bushels per acre.

The efficiency of farming in the newer districts, as expressed by average yields, is naturally lower than those of older settled areas, but even in the latter areas of liberal rainfall and favourable soil the same range of efficiency was disclosed. In point of fact, as was shown recently,* the low average wheat yields are due mainly to neglect on the part of a large number of growers to follow well-established principles in cultivation—fallowing, thorough working of the fallows, liberal use of soluble phosphate, rotational cropping, choice of suitable varieties of wheat, and proper treatment of the seed.

It is safe to say that, so far as South Australia and Victoria are concerned, the average yields of wheat per acre might be increased at least by 50 per cent. if all wheatgrowers followed in entirety the standard practices which are suggested by the research and demonstration work carried out by these States. This is one of the important problems in agricultural education and extension.

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* A. E. V. Richardson, "Increased Efficiency in Wheat Production," Jour. of Agric., South Aust. (33, 297-316).

Still further increases will follow from any advances that are made in the control of fungus pests—take-all, footrot, flag-smut, and rust in wheat—which cause such appalling losses each year; the further developments in breeding improved wheat varieties; or in the determination of the physiological and morphological factors on which drought resistance is based. These problems can be solved only by intensive research.

Pastoral Industries.

Passing now to the pastoral industries—sheep, cattle, dairying—it may be said that practically the entire stock population, consisting of 100,000,000 sheep and 14,000,000 cattle, are maintained on the pastures. The output from the pastoral and dairying industries could be enormously increased if this large stock population could be (1) kept free from disease, and (2) adequately nourished, especially during periods of nutritional stress.

Animal Diseases.

Disease exacts a heavy annual toll from the live stock industries. Blowfly, liver-fluke, footrot, braxy, caseous lymphadenitis, and other diseases in sheep cause in the aggregate losses amounting to millions sterling annually. Similarly, in cattle, heavy losses are caused by worm nodules, tick, buffalo fly, pleuro-pneumonia, contagious abortion, mammitis, and tuberculosis. Time will not permit a detailed consideration of these pests.

Some of these pests—e.g., blowfly and buffalo fly—are being attacked by the Entomological Division of the Council for Scientific and Industrial Research, and many parasites are being studied with a view of combating these pests by methods of biological control.

The magnificent gift of Mr. F. D. McMaster of £20,000 for the establishment of a laboratory at Sydney University will enable research work on some of these important diseases to be undertaken, but the field to be covered is so vast and the issue so great that ultimately laboratories will need to be established at other centres to cope with the problems of disease affecting the pastoral industries.

Excellent work on animal diseases has been done by the Veterinary Research Station at Glenfield, New South Wales, but even the combined resources of Glenfield and the McMaster Laboratory will be insufficient to cover the wide field of investigation in a reasonable time.

Grassland Improvement.

The pasture lands of Australia provide the food supply of almost the entire stock population. The welfare of the stock is therefore ultimately dependent on the amount and nutritive value of the grass. No country is so dependent as Australia upon its pastures, and probably no country presents greater difficulties in the way of increased production from grass lands on account of the vastness of the areas, the diversity of soil and climatic conditions, erratic rainfall, liability to drought, all of which influence economic pasture production.

As only about 1 per cent. of the area of Australia is under cultivation, either with crops or sown grasses, it follows that for many years, and in the semi-arid portions perhaps indefinitely, the exploitation of the natural pastures must be looked upon as the main source of raw material for the pastoral industries.

The rational utilisation of the grassland resources is dependent upon a knowledge of the relationship of the various types of grassland herbage to one another and to the climatic, edaphic, and biotic factors which control them.

The first step is to classify the grasslands of each climatic and soil region in Australia according to the species of plants contributing to the pasture association, and to establish unit areas based on similarity in composition. The next step is to determine the extent to which each major grassland association may be modified by fertilisers, introduction of new species, and various forms of pasture management. With knowledge of such a nature available the work of developing grasslands would rest on a sound basis.

It must be borne in mind that the pastures of Australia over wide areas have seriously deteriorated in value. Prior to settlement the herbage of Australia was in equilibrium with a light grazing marsupial fauna. The advent of the white man with his flocks of sheep and cattle, his droves of rabbits, and the numerous plant immigrants, some useful but many noxious, that followed closely on his trail, upset the age-old balance of vegetation. The balance was further disturbed by occasional overstocking, accentuated by drought.

Little wonder that many of the valuable and palatable indigenous species have disappeared, that noxious weeds from other lands have rapidly spread themselves, and that the pastures have deteriorated in carrying capacity. Moreover for several generations there has been a continual drain on the pastures to supply the mineral nutrients required for the bony framework of the animals sold off the farms to supply the cities with food and raiment. In many parts of Australia this depletion of the soil in mineral nutrients, and particularly in phosphates, has been reflected in the condition of the stock, and the so-called deficiency diseases, or malnutrition, as evidenced by bone-chewing, are the result.

I made a calculation some years ago for the rate of depletion of phosphates from pastoral properties in Victoria, and showed that the equivalent of 1,800,000 tons of superphosphate had been removed from the pastoral properties of Victoria in the form of slaughtered animals and animal products during the last sixty years. Many million tons of phosphates would be needed to bring back the phosphate content of the pastoral soils of Australia to what they were at the beginning of settlement.

Viewing the grasslands of Australia as a whole, comparatively little attention has been devoted in the past to those intensive methods of animal production which characterise the practice of older countries—namely, the use of seeded pastures, improvements by topdressing with phosphates and nitrogenous fertilisers, conservation of the surplus growth for use during periods of nutritional stress, and improved methods of pasture management. Nevertheless, the change from extensive to intensive methods of production is making considerable headway, especially in the southern grassland region.

We may consider briefly some of these avenues of improvement.

Sown Pastures.—Some 4,500,000 acres, mostly in the coastal and elevated areas of Australia, have been sown with grasses. This area is quite insignificant in comparison with the area of Australia, or even the area of sown grassland in England. There is room for an enormous expansion in the area under seeded pastures, which normally exceed in carrying capacity and nutritive value the indigenous pasture which it replaces.

The remarkable transformation of the coastal areas of New South Wales and Queensland by the introduction of the Brazilian pasture plant (*Paspalum dilatatum*), and the equally remarkable effects of the introduction of Subterranean clover in the better rainfall country of South Australia and Western Australia, are illustrations of the greatly increased carrying capacity following on the introduction of superior types of pasture plants for specific environments.

The New South Wales Department of Agriculture has done much valuable work in demonstrating how production in the better rainfall areas may be increased by replacing indigenous vegetation with seeded exotic pasture plants. One of the activities of the Division of Plant Industry of the Council for Scientific and Industrial Research is the organisation of a plant introduction service whereby improved fodder and pasture plants from other parts of the world will be introduced and thoroughly tested out in co-operation with the State Departments of Agriculture in various parts of Australia.

Top Dressing.—The top dressing of pastures with artificial fertilisers provides a means of greatly increasing the output of grass regions of liberal rainfall. In the light of numerous investigations in several of the States, it is safe to say that the carrying capacity of pasture lands in regions of heavy to moderate rainfall can be more than doubled by top dressing with soluble phosphates at a comparatively trifling cost. While there has been a gratifying development in the practice of top dressing in the southern grassland region during recent years, it may be said that there are enormous areas of grassland—many millions of acres—in the higher rainfall areas of Australia which have never yet received a dressing of artificial fertiliser.

The investigations have shown that the productivity of the pasture is greatly increased by the application of phosphates; the quality of the pasture is improved both in protein and minerals largely by the stimulation of leguminous plants in the sward; and that the health, vigour, and fertility of the grazing animals have been vastly improved. Investigational work, moreover, has shown that the chemical composition of a pasture is a reflex of the soil on which it is grown, and that soils deficient in phosphate produce phosphate-starved grass, which in turn produces in grazing animals the characteristic symptoms of malnutrition and the deficiency diseases so frequently met with in Australia.

Apart from the use of phosphates, there remains the very important problem of determining the rôle of nitrogenous fertilisers in intensifying production from grasslands, especially on the sown pastures in the regions of heavier rainfall.

Mineral Licks.

In areas of light rainfall where economic considerations do not permit the use of top dressing, phosphate deficiency in the pasture may be corrected by allowing stock free access to mineral licks. The supplementing of the pastures with mineral licks has been fairly common in certain districts of Australia, particularly in Queensland, New South Wales, and Western Victoria, but the practice of using licks needs to be placed on a sound basis by ascertaining the major mineral deficiencies in each grassland region and adjusting the composition of the lick to the ascertained deficiencies in the pasture, and to the special needs of the grazing animals. The requirements will vary in the different grassland areas, and probably reach a maximum just before the normal break in the season.

Pasture Management.

Much might be said, did time permit, regarding the recent work in Britain, Germany, and New Zealand on the intensive system of grassland production in regions of heavy rainfall.

Recent work at Cambridge has revealed the fact that dried young herbage from a pasture has a mineral and protein content approximating that of the best concentrated stock foods, and that if pastures can, by controlled grazing and pasture management, be kept in a young leafy condition, the production of milk can be greatly stimulated.

Intensive methods of pasture management are being applied with great success in New Zealand, and the output of dairy products from that Dominion have increased by leaps and bounds during recent years. In the aggregate, the area of rich land available for such methods of grassland production is greater than the area available in New Zealand.

The output from the dairying industry, which is mainly located in the heavier rainfall areas, could be tremendously increased, apart from herd testing and better methods of breeding, through the more extended development of seeded pastures, the wholesale use of artificial fertilisers, the more general adoption of improved methods of pasture management, and the utilisation of the wonderful flush of grass towards the climax of the growing season.

Supplementary Feeding During Periods of Nutritional Stress.

Mature herbage has been shown to be of much lower nutritive value than young herbage, which is particularly rich in proteins and minerals and low in indigestible fibre. Mature dry herbage rapidly deteriorates in the field because of the leaching of soluble nutrients by dews and rain, the spread of fungi, shedding of seed, and the loss of leaf by wind and the trampling of stock. The fibre content of such herbage becomes high in proportion to the protein and mineral content, and the nutritive value of the herbage very low.

The Division of Animal Nutrition of the Council of Scientific and Industrial Research has been engaged on work of fundamental importance to the wool industry. It has shown that a most important constituent of wool is the sulphur-bearing ammo-compound known as cystine. The Division has demonstrated that "wool break" is usually caused by nutritional distress brought about by a diet deficient in cystine, and that this break in the fibre may be obviated by supplementary feeding with cystine rich proteins.

Moreover, some very important results have been recently obtained at Meteor Downs, in Queensland, on the effect of cystine rich foodstuffs used as a supplement to the pastures. The supplement chosen was sterilised blood meal. Two groups of lambs, each consisting of 100, were grazed in equal sized paddocks. The lambs receiving a supplementary diet of blood meal at the rate of about ½ oz. per day produced an average of 20 oz. extra wool than the lambs receiving no blood meal. The cost of the supplementary feeding averaged less than 10d. per head.

The net result, therefore, at this particular station was that 20 oz. of wool per sheep were obtained for an expenditure of less than 10d.

The Division is now engaged in a search for rich cystine-bearing material to use as supplementary feeding for sheep.

THE COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH.

It is clear from what has already been stated that there is wide scope for scientific research into the problems which limit production from the primary industries. The Commonwealth Government established the Council for Scientific and

Industrial Research to initiate and carry out scientific researches for the promotion of the primary and secondary industries. As the primary industries were of such outstanding importance to the welfare of the States and the Commonwealth, the main efforts of the Council have been directed to the scientific problems associated with primary production.

From its inception the Council sought to co-operate and collaborate with State Departments of Agriculture and Universities in the development of this important field of research. It convened a representative conference of these bodies in 1927 to consider the relative spheres of the Council and State Institutions in regard to Agricultural Research. The conference decided that in view of the number and magnitude of the problems confronting the agricultural and live stock industries of Australia, Commonwealth participation in agricultural research was desirable, and indicated many fields of work in which research might be conducted on a national basis—e.g., animal diseases, animal nutrition, plant pathology, entomology, and soil research.

The Council for Scientific and Industrial Research appointed a standing Committee on Agriculture comprising the permanent heads of the State Agricultural Departments, to ensure complete co-operation and collaboration with State institutions in the development of agricultural research in Australia.

It was recognised that there need be no overlapping of effort of Commonwealth and State activities if the Commonwealth restricted its efforts to the major problems affecting great climatic regions rather than political boundaries—the more or less national and fundamental problems of nutrition and disease in crops and stock and on soil problems and forest products research—whilst the States continued their work on problems of special local importance and interest, and to the application of the knowledge gained to the improvement of practice.

Six divisions have been established to attack major sections of the work, each being under the control of an eminent authority. The Divisions already established are animal nutrition, animal health, plant industry, entomology, soil science, and forest products. The shortage of scientific personnel adequately trained in directions necessary for the investigation of Australian problems has been a serious factor militating against progress. The effect of the world-wide movement for the greater application of science to industry that has taken place since the war has resulted in an acute shortage of research workers trained in sciences broadly classed as biological. Nevertheless, the progress made by these Divisions has been very satisfactory, and the results of the work have been made available in the publication of the Council for Scientific and Industrial Research.

Co-operation has not only been sought with State Departments of Agriculture and the Universities, but a close link has been forged with British Research Institutions through the Imperial Bureaux and the Empire Marketing Board. A large appropriation has been made by the Empire Marketing Board towards the testing out by Australia on a large scale the possibilities of biological control of insect pests and noxious weeds. The results of this co-operative investigation will be of great significance not only to Australia, but to the whole Empire.

The advent of the Council for Scientific and Industrial Research into the field of agricultural and pastoral research should stimulate and assist the development of research in State Departments of Agriculture and Universities.

STATE DEPARTMENTS OF AGRICULTURE.

It would be difficult to assess the immense value of the research and extension work conducted by the Departments of Agriculture, and the effect of this work in developing the agricultural industries.

The marked advances that have been made in the wheat industry during the past decade is one striking illustration of the success which has attended their efforts in the direction of research and extension. These State Departments should be encouraged to develop their research work to the utmost extent, because it forms the only basis on which a rational system of extension and propaganda work in agriculture can be developed. In the enthusiasm to promote agriculture, a State may be tempted to encourage extension and propaganda work without providing a sound and adequate basis for such propaganda through research. Such efforts are bound to fail because experience elsewhere has shown that research and then demonstration must always precede propaganda. American agricultural institutions completely failed to influence the farming classes until a sound basis for teaching and extension had been accumulated through the work of the Agricultural Experiment Stations.

It is recognised elsewhere that the modern agricultural State must cultivate agricultural research and extension if it is to survive in world competition with its agricultural products. The clear lesson of experience in all great agricultural countries of the world is that a permanent increase in the output from the land can only be achieved by applying the results of research and the teachings of science to every branch of primary production. As production from the agricultural and pastoral industries becomes more intensive and diversified there will be an increasing demand for knowledge of the principles underlying agricultural and pastoral production, the methods of controlling crop and animal diseases, and this demand can be satisfied only by the further development of the facilities for research and extension work in agriculture.

CONCLUSION.

In other countries a strong national sentiment has been developed towards agriculture. The administrators of agricultural countries such as the United States, Canada, South Africa, Denmark, Japan, and Java, not only believe that agriculture is the basis of the country's wealth, but they translate this belief into action and legislation. These nations think in terms of agriculture. This attitude finds practical expression in the liberality with which agricultural research is supported and the readiness with which these countries map out policies for steady, continuous development over long periods.

Australia has the most varied conditions of agriculture of any single political unit in the Empire—a climatic range from tropical to temperate conditions, from highly humid to very arid conditions—with a corresponding variety in production. Moreover, it is a country of continental dimensions with a relatively sparse population enjoying a high standard of living. The full development of its agricultural resources can be realised by maintaining high efficiency in output of agricultural produce per man, by the use of labour-saving machinery, efficient methods of production, and applying all the resources of science to the cultivation of the land and the raising of livestock.

In view of the importance of the primary industries to national welfare, it is highly desirable that our resources should be conserved by the best methods known, that they should be developed to the highest degree attainable, and that the conception of an organised agriculture based on development through research and education should be part of the mental equipment of every statesman and administrator.

SURVEY OF QUEENSLAND SOILS.

The Secretary for Agriculture and Stock, Mr. H. F. Walker, M.L.A., announced recently that Mr. J. R. Taylor, M.Sc., Commonwealth Soil Survey Officer attached to the Council for Scientific and Industrial Research, had just completed a visit to Queensland which had extended since 5th May last. His visit was consequent on an invitation from Mr. Walker for the purpose of advising his Department upon matters connected with the future soil investigation of Queensland, with particular reference to a suggested soil survey of certain areas likely to be later available for development. In the first instance Mr. Taylor, accompanied by Dr. Kerr, Soil Technologist to the Bureau of Sugar Experiment Stations, Mr. G. B. Brooks, Senior Instructor in Agriculture, Mr. N. King, of the Agricultural Chemist's Branch, visited the Mackay district, where four days were spent on the Eungella lands, as well as all the cane areas within a radius of about 10 miles of Mackay. In the latter areas the various types of soil on which sugar-cane is growing were specially examined. Mr. Taylor next proceeded to the Dawson Valley, spending about a week there, mainly in the Theodore zone. On his return to Brisbane some days were spent at the Congress of the Australasian Association for the Advancement of Science, and Mr. Taylor's next journey was to the district between Roma and Toowoomba, with the special object of looking into the possibilities of the extension of wheatgrowing in the section to the west of Dalby, and south of the railway line between Dalby and Roma. Mr. Taylor has returned to his headquarters at the Waite Institute, Adelaide. He will later furnish a report to the Minister embodying his observations and suggestions for the carrying out of soil survey work in Queensland.

CLIMATOLOGICAL TABLE—MAY, 1930.

SUPPLIED BY THE COMMONWEALTH OF AUSTRALIA METEOROLOGICAL BUREAU, BRISBANE.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature. Means.		Shade Temperature. Extremes.				Rainfall.	
		Max.	Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	30·00	82	70	88	3	50	31	449	12
Herberton	..	72	58	80	8	52	22	223	14
Rockhampton	30·13	77	60	85	11	50	15	478	11
Brisbane	30·22	72	57	81	12	50	15	798	15
Darling Downs.									
Dalby	30·23	71	47	78	11	34	15	221	7
Stanthorpe	..	63	44	69	5,18	28	17	284	13
Toowoomba	..	63	47	73	16	35	15	550	13
Mid-interior.									
Georgetown	29·99	86	63	92	7,11	55	3,4,5,6	30	2
Longreach	30·11	78	54	86	11	44	15	302	4
Mitchell	30·20	70	46	81	11	33	18	174	6
Western.									
Burketown	30·02	86	63	94	11	59	16,20, 21,22	47	2
Boulia	30·09	80	51	89	6,7	39	15	17	1
Thargomindah	30·18	71	51	81	11	41	16	53	2

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF MAY, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING MAY, 1930 AND 1929, FOR COMPARISON.

Divisions and Stations.	Average Rainfall. May.	Average Rainfall. No. of Years' Records.	Total Rainfall. May, 1930.	Total Rainfall. May, 1929.
North Coast.	In.		In.	In.
Atherton	1·89	29	3·77	1·29
Cairns	4·32	48	6·07	1 96
Cardwell	3·45	58	6·52	1·61
Cooktown	2·84	54	4·52	0·71
Herberton	1·57	43	2·48	0·81
Ingham	3·24	38	8·08	0·76
Innisfail	12·05	49	22·91	3·77
Mossman	3·32	17	6·49	2·36
Townsville	1·26	59	4·48	0
Central Coast.				
Ayr	1·05	43	3·00	0
Bowen	1·24	59	5·73	0
Charters Towers ..	0·73	48	3·75	0
Mackay	3·67	59	7·92	0·34
Proserpine	4·22	27	5·87	1·06
St. Lawrence	1·71	59	5·96	0
South Coast.				
Biggenden	1·70	31	2·34	0
Bundaberg	2·61	47	3·37	0·31
Brisbane	2·83	78	7·98	0·42
Caboolture .. .	2·77	43	8·38	0·47
Childers .. .	2·10	35	3·16	0·22
Crohamhurst ..	4·74	37	15·58	0·89
Esk .. .	1·94	43	5·27	0·14
Gayndah	1·49	59	5·90	0
Gympie	2·85	60	4·42	0·12
Kilkivan	1·80	51	4·14	0
Maryborough .	3·04	58	5·66	0·25
South Coast—continued:				
Nambour	4·69	34	8·87	0·72
Nanango	1·47	48	3·47	0
Rockhampton ..	1·40	43	4·78	0
Woodford	2·82	43	9 04	0·44
Darling Downs.				
Dalby	1·29	60	2·21	0·12
Emu Vale	1·10	34	2·39	0·31
Jimbour	1·17	42	2·21	0·03
Miles	1·46	45	3·22	0
Stanthorpe	1·84	57	2·84	0·23
Toowoomba ..	2·14	58	5·50	0·05
Warwick	1·52	65	2·86	0·09
Maranoa.				
Roma	1·41	56	1·97	0·
State Farms, &c.				
Bungeworgorai ..	0·75	16	2·00	0
Gatton College ..	1·55	31	3·25	0·07
Gindie	0·86	31	3·76	0
Hermitage	1·11	24	2·52	0·09
Kairi	1·68	16	4·50	0·50
Mackay Sugar Experiment Station ..	3·15	33	7·88	0·35
Warren	0·83	15	..	0

GEORGE G. BOND, Divisional Meteorologist.

STANTHORPE FRUIT INDUSTRY.

REPORT FOR THE 1929-1930 SEASON.

The Director of Fruit Culture, Mr. George Williams, has received the following report from Mr. H. St. John Pratt, Instructor in Fruit Culture:—

As anticipated, the Stanthorpe fruitgrowers have not had as prosperous a season this year as last when prices for all classes of fruit and vegetables were abnormally high, especially in Sydney, and Stanthorpe reaped the benefit. This year, prices although considerably lower than last year are still above the average, and the note of pessimism sounded in some quarters is due to the fact that certain growers have been inclined to take last season as normal whereas it was decidedly abnormal.

A Year of Abundance.

This season the growers of early stone fruit did exceptionally well up to Christmas, but after the New Year prices were disappointing for all classes of fruit and still more so for vegetables.

This season has been one of abundance and plenty for all classes of fruit and vegetables, not only in Queensland but also in New South Wales.

In Stanthorpe there has been a large crop of all varieties of fruit—apples, pears, peaches, plums, and grapes, as well as vegetables.

This seldom happens, usually if there is a heavy stone fruit crop, then the apples will be light, or if they be heavy then perhaps grapes will be light, but the season 1929-30 will be remembered as one when all classes of fruit cropped exceptionally heavily.

Of course the best condition from a Stanthorpe point of view arises from a dry season elsewhere with a moderate rainfall in Stanthorpe.

Prices.

Although prices, generally speaking, have been much lower than last year, yet many growers have done as well as last year; especially those who have established for themselves private markets. This avenue of disposing of produce is being exploited more every year with ever increasing satisfaction to both producer and consumer. There is also an increasing delivery of fruit and vegetables to the Northern Rivers of New South Wales per media of motor lorries.

The glut in fruit and vegetables and consequent low prices is to some extent due to the coal strike in New South Wales and the prevailing unemployment. Men out of work with no immediate prospect of obtaining it very often start a garden and not only grow their own requirements but also a surplus which they sell—in fact, they become market gardeners on a small scale.

Improved Cultural Practice.

Although there is still room for improvement, a better class of fruit is marketed each year from Stanthorpe—more thinning out was done for last season than the previous one, and the large crop just experienced has still more forcibly brought home to many growers the absolute necessity of only growing and marketing the very best of fruit and vegetables.

There is proceeding in Stanthorpe the gradual elimination of the worthless and poorer varieties of fruit. A large number of trees were reworked last season, and from inquiries at the office it is apparent that an even larger number will be reworked this year. Needless to say this elimination must be gradual as the average orchardist cannot afford to put too many trees out of commission, as it were, at once. This office serves quite a useful purpose in collecting and distributing scions of approved varieties from specially selected trees of the various varieties for this purpose.

Pest Control.

The chief outstanding feature of the year has been the remarkable absence of fruit fly. It is quite safe to say that there has been considerably less fruit fly this year than in any year for the last ten years.

The fly made its appearance all over the district last November as usual, but the orchardists were careful to immediately pick off and destroy all infected fruit, with the result that there has been this year a minimum of fly.

Of course other agencies may have been at work which prevented invasions of fly from other districts, but, generally speaking, the Stanthorpe orchardists have done their part as to fly control.

The same, however, cannot be said as to Codlin Moth. There has been far too much moth in the district this season, and the growers together with the officers of the Agricultural Department must view this problem very seriously. It is a pest

that can be controlled and, generally speaking, any grower who is more or less free from moth can take all the credit to himself, and, conversely, a grower who has suffered severely must at least take most of the blame.

A very large crop of grapes has been harvested, due to a great extent to the weather being so very favourable to grape production—a fact which accounted largely for the almost entire absence of disease. In fact the weather has been almost too good as the careful grower has not reaped the benefit that he usually does (and is justly entitled to) over the grower who is not so assiduous with his spraying and other field operations for the prevention of disease.

Oversea Export.

The export of fruit from the Summit district to the East has also been an outstanding feature of the past season. The Producers' Distributing Co-operative Society, which is the fruit section of the Coastal Farmers' Sydney, purchased 2,500 bushels of apples from the Summit district in late January and early February, and exported them to the Fresh Fruit Receivers Limited, Singapore, for whom they are the Australian agents. This fruit arrived in good condition, also a trial consignment of pears, peaches, English and Japanese plums, thereby successfully demonstrating that all these classes of fruit can be exported to the East provided that sufficient care is taken in the grading and packing together with due regard to picking at the right time.

The P.D.S. Co. is keenly interested in Stanthorpe stone fruits as well as apples on account of both their fine quality and earliness, and it is confidently expected that increased consignments will be exported to the East this coming season.

The greatest care and supervision must be taken with such orders because Stanthorpe is up against an established and strongly entrenched United States of America market, and one consignment of inferior fruit or fruit arriving in bad condition would probably spoil this market for many years to come. Also 200 cases of apples were exported to Colombo and 100 cases to Hamburg as a sample consignment to test out these markets.

Another outstanding activity of the year was the establishment of a community packing house by the Committee of Direction at the Summit.

The deciduous section of the Committee of Direction having a sum of money to its credit the question arose as to how a portion of it could be spent in the best interests of the section. As marketing of the fruit appeared to be the operation requiring the greatest help, and it was thought by the district that packing houses would improve the operation, the Committee of Direction was asked to build a packing house in what it considered the most favourable locality in the district for that purpose. Eventually the Summit was decided on as the site, and the successful packing of apples the objective. Unfortunately the shed was not completed and ready to receive fruit before 15th January, by which time most of the early apples had been harvested, and so the season for the packing house was considerably curtailed. However, in spite of this and the setbacks which always attend a new venture, more especially one where co-operation is essential, the packing house has justified the experiment being made. The growers supplying it have expressed their satisfaction with it and its management, and it is expected and hoped that other districts will be requesting the same assistance from the Committee of Direction, and eventually there will be a chain of packing houses throughout the district selling Granite Belt fruit under the one brand.

The Marketing of Immature Fruit.

The marketing of immature and undersized fruit still remains a problem. Growers who persist in the practice are not only doing no good themselves but are a serious menace to the more intelligent orchardist who takes a pride in the quality and get-up of his produce.

The Coming Season.

The planting of new trees promises to be heavy this season. Good orchards are not for sale and the prospects for the coming year and the future of the industry are, I consider, good. The more successful orchardists are extending their areas under trees.

Successful Queensland Exhibitor at Hobart.

A report on the district would not be complete without a brief reference to Mr. Douglas Gow, who exhibited the other day so successfully at the Fruit Exhibition held at Hobart in the "Colombie Cup" competition or Grand Championship of Australia. All the States except Western and South Australia were represented in

this championship, the entries being eight from Tasmania, two from Victoria, and one each from New South Wales and Stanthorpe. The class was for five varieties of apples, one case of each, and Mr. Gow came 3rd with 432½ points out of 500. The winners gained 439½ points and 436½ points was second. Thus it will be seen that Gow was only 7 points behind the winner, or just over 1 point per case behind. When it is realised that the Southern fruit was practically exhibited direct from the tree, whereas that from Stanthorpe had to be held in cool store for six weeks, and then put up with eight days transport by rail and boat, it must be conceded that there is not much wrong with the Stanthorpe fruit and that it can hold its own anywhere. Mr. Gow is congratulated on his success, and the best thanks of the community are accorded him for advertising this district so forcibly and attractively.

THE THIN-SHELLED QUEENSLAND NUT.

By GEORGE WILLIAMS, Director of Fruit Culture.

The Queensland Nut (Macadamia) indigenous to the south-east coast lands of this State and to the north-east part of New South Wales provides excellent opportunity for the establishment of a profitable industry—apathetically neglected up to the present in favour of exotic perishable products more or less subject to disease to which the Macadamia so far as is known is immune.

Several types of nuts are produced upon trees of varying habit from the small spherical hard-shelled specimens which were found in the scrub lands mainly from Brisbane north and as far as Bauple. The small tree by which these are produced is of compact growth with usually small, glossy green foliage upon which the spiney borders are almost or entirely absent, more particularly on the older trees. The small white inflorescence is supported on short pendicles and seldom followed by more than two nuts, usually one. In the large fruited varieties the flowers are generally shaded with pink and the pendicles admit of carrying up to two dozen nuts. (The specimen illustrated, of the thin-shelled type, carries nineteen, produced on a four-year-old tree, not grown under very favourable conditions). Messrs. J. W. Waldron, of Eungella, and S. M. Greer, of Upper Dungay, have given much attention to improvement by selection, resulting in very fine types being now available. The thin-shelled, which succumbs under the pressure of ordinary nut crackers, is of medium size. A much larger type which may be readily opened with a pocket knife has been named "ever-bearing" on account of its productivity. Though variations are noted in the foliage of seedling trees, particularly the thin shelled, the principal features of their products do not seem to vary. The trees are more vigorous and productive than the small hard type and attain much greater dimensions.

Though indigenous and hardy under favourable conditions the Macadamia is subject to injury by heavy frost and will not thrive in a soil in which drainage is deficient. Its natural habit being fertile scrub lands it naturally follows that cultivation should follow upon similar soils or those nearly akin to them. Many of our banana plantations, which are not reasonably adapted for the production of other crops and are comparatively valueless after the profitable term of the bananas has been reached, could be interplanted with Queensland nuts which as they develop would give a most satisfactory return for a minimum of expense. Interplanting between bananas could be considered in plantations where all cultivation is effected by hand tools. The young trees will thrive under partial shade and would be several years in advance of those planted after the bananas were defunct.

The distances allowed between plants could be carried somewhat to fit in with other operations, a range of 24 to 30 feet apart would cover most situations. The average age at which the young trees become reasonably productive is about eight years. This appears a long distance ahead, but when compared with several fruit crops which entail general cultivation and suppression of disease for a minimum of five years before being reasonably productive, the advantage is much in favour of the nut whose crops are matured with a minimum of attention and can be held for a favourable market if so desired. There can be no question regarding market prospects; the quantity of nuts imported will dispel any doubts, and it may also be mentioned that inquiries have been received from overseas for quotations for up to 20-ton lots. The yield from developed trees varies from 50 to 150 lb., the few trees from which the nuts are sold in Brisbane averaging a cash return of £4 to £5 per annum. Allowing that a reduction of 33⅓ to 50 per cent. resulted as an effect of heavy production (a position which is extremely unlikely), the net return from the expenditure of an equal amount on any of our fruit tree crops would not show the nut to disadvantage.

Plate 2.—A Cluster of Queensland Nuts, Thin-shelled Variety.

THE COTTON INDUSTRY.

The Minister for Agriculture and Stock (Hon. H. F. Walker) made the following announcement recently:—

FOLLOWING on my recent trip of inspection through the Burnett, Callide Valley, and Wowan-Dululu areas, I have been in consultation with the Cotton Specialist of the Department regarding the carrying out during the coming season of a comprehensive set of varietal trials which will test out the possibilities of all cottons now under investigation. It appears by the results which have been obtained this season from the test plots and varietal trials that some of the varieties which have been imported by the Department may give more satisfactory results during abnormal seasons than does the Durango cotton, which is the main variety being grown at present. This applies particularly to some of the districts where either heavy rainfall or droughty conditions may be experienced at critical times in the development of the plants.

Varietal Trials.

The failure of the Durango variety to give satisfactory results under abnormal conditions was stressed at several of the meetings at which I had the pleasure to meet the cotton-growers in the districts mentioned. I advised at the time that the matter would be gone into very carefully, and now wish to announce that during the coming season a large series of varietal tests will be carried out with grower co-operators in the different cotton-growing areas of the State. These tests will be designed so as to allow of the obtaining of the most accurate information concerning the value of the varieties to the different districts. I wish to stress at this point, however, that the experiences in all other cotton-growing countries indicate the desirability of growing as few varieties as it is possible to carry on with, and the absolute necessity of growing only one variety in a district. Where two or more varieties are grown within a section, not only does contamination of the varieties take place through admixture of the seed in the ginnery machinery, but also through cross-pollination in the field by various insects. We have already had one experience in Queensland with the results to be obtained by growing a variety of mixed origin, and it is hoped that all growers will realise the necessity of growing only the one variety in a district.

Imported Seed.

As promised to a deputation of the Queensland Cotton Board, consideration has also been given to the importation from the United States of America of seed of medium stapled varieties, and which are quicker maturing than is Durango. Following on a conference with the manager of the Cotton Board and the Cotton Specialist of the Department, it was decided to import a half-ton each of seed of two varieties which appear to have possibilities under Queensland conditions. In addition to these, 100-lb. lots of seed of eight other varieties are also being obtained. Every precaution will be taken to make this seed free from insect and fungoid diseases. The seeds will also be planted in isolated quarantine areas, so the danger of introduction of serious pests or diseases into the main cotton area will be reduced to a minimum.

The Department considers it inadvisable to import larger quantities of seed of each variety, not only on account of the danger of introduction of injurious pests and diseases, but also of the "new place effect" which varieties of cotton often exhibit when introduced into countries with different climatic and soil conditions. The experiences with several of the varieties which the Department has introduced have indicated that very misleading results may be obtained in the tests conducted during the first few seasons a variety is tried out. Experiences in other cotton-growing countries have also been along similar lines. It is believed, therefore, it is better to at least partially acclimatise a variety before conducting any large scale of tests.

Durango Results.

The growers may rest assured, however, that the Department is going to try and overcome the difficulties which appear to have arisen in connection with growing the Durango variety in some areas. I would point out, however, that in some districts this variety has given excellent results over a series of years, and during my recent trip growers assured me they were well satisfied with the returns they had obtained from it. It can be seen, therefore, that it may be necessary to carry out a large number of carefully conducted experiments over a series of years before any finality may be reached as to which variety or varieties are best suited to Queensland conditions. This will require the hearty co-operation of the growers in the many districts in assisting the departmental officials in carrying out these most important tests.

BANANA EXPERIMENT STATION, KIN KIN.

ACTING MANAGER'S REPORT.

The Director of Fruit Culture, Mr. George Williams, has received the subjoined report from Mr. H. Collard, Acting Manager of the Kin Kin Banana Experiment Station.

Plot No. 1.

Variety, Gros Michel; when planted, January, 1929; distance apart, 15 x 15; fertiliser applied, No. 5 (3 lb.), N. soda super, and muriate of potash; cost of fertiliser per stool, 7d.

Desuckering to produce in separate rows, 1-2 and 3 followers. Baiting with cut portion of pseudostem dusted with Paris green and flour 1-6, also with borax and flour 1-5. This method of control for beetle borer was undertaken immediately after my arrival in October, 1929, and continued up to January last.

Regarding the present condition of these plants, the majority of which are carrying bunches, the growth generally is poor, rather short in stature, and lacking in girth. The plants attain a height of 6 to 8 feet, then produce bunches carrying 8 to 11 hands of bananas, 6 to 7 inches in length, 7 inches being the average length. The suckers for subsequent fruiting are of a comparatively poor type, attributable to unfavourable conditions, notably imperfect drainage in places, excessive shale, and absence of soil in other parts combined with leaching of essential plant foods.

Leaf spot and premature leaf decay are particularly conspicuous throughout this plot.

Plot No. 2.

Variety, Sugar; when planted, February, 1929; distance apart, 15 x 15; fertilisers applied, No. 5 (3 lb.), super, and muriate of potash 1-1; cost of fertiliser per stool, 6d.

When regard is paid to cost of fertiliser per stool and the ingredients applied, the general appearance of both parent plants and followers does not come up to expectation. Bunches of from 5 to 8 hands are carrying fruit rather below the standard quality for this variety.

During November, 1929, Mauritius Beans were planted in double rows between alternate rows of stools, for the purpose of determining whether a detrimental or beneficial effect might be observed in so far as the general appearance of plants are concerned when growing a crop of legumes in close proximity over a lengthy period.

Evidence so far obtained tends to favour rather than discourage this procedure, for the vigour of both parent plants and suckers up to the present stage are by no means impaired but rather the contrary; furthermore, from an economical viewpoint, a considerable saving is effected in chipping, and considerably less damage caused to surface roots, whilst the soil between the rows maintains a more even moisture and helps to retain the surface soil brought down from the higher areas during erosion. Fertilisers were again applied during the past month in varying quantities per stool of incomplete and complete fertilisers.

Plot No. 3.

Variety, Cavendish; when planted, January, 1929; distance apart, 10 x 10; fertilisers applied, No. 5 (3 lb.), Nauru (2 lb.); cost of fertilisers per stool, 5½d.

This plot has been set apart for Leaf Spot experiments, and also for beetle borer control. The work in connection with the former has been carried out under instructions from Mr. J. H. Simmonds, Plant Pathologist.

The vacancies occurring by the removal of these plants have been at various times replaced by carefully selected suckers and butts, these being treated with coal tar and water boiled together for twenty minutes, strength 1-3.

The plants after immersion in this preparation were planted and three months later thirty-four plants upon examination gave the following results, twenty-one completely rotten with no indication of having been attacked by the borer.

One plant having two adult beetles (alive) and two plants each having one adult beetle (alive) on the corms, but in no instance was actual tunnelling observed. Tar treatment has proved fatal to the majority of suckers and butts set out in shaley gullies, but when planted in a reasonable depth of soil, although undoubtedly retarding growth, eventually assumes normal development apparently unimpaired by the treatment.

Leaf spot and premature leaf decay, particularly towards the northern and western extremities of this plot, is much in evidence, which condition is obviously accentuated—in the former case by excessive clay.

The plants throughout this plot show a marked variation both in regard to vigour and size of bunches, the latter varying from 7 to 9 hands with fruit from 5½ inches to 6½ inches long.

A definite black moistened apex apparently originating at the flower tip is frequently observed and affecting a fairly large proportion of bananas, the dark moistened area extending and encircling the skin of the fruit. This affected area exudes small gummy spherical particles. I intend bringing these particular bananas under the notice of Mr. Simmonds on his next visit to this station.

Plot No. 4.

Variety, Cavendish; when planted, January, 1929; distance apart, 10 x 10; fertiliser applied, N. soda (1 lb.), amm. sulph. (2 lb.), cost of fertiliser per stool, 5¾d.

This plot is situated on the eastern boundary and having better soil, lesser amount of shale, and good drainage. The plants possess a good girth of pseudo stem, but lacking in height; the followers are making very fair growth. Bunches vary from 8 to 10 hands of fair quality fruit. The effect of nitrogen in combination with more favourable soil conditions was very marked in both leaf development and colour during December and January.

Leaf spot although present is of lesser extent than observed in Plot 3.

Plot No. 5.

Variety, Lady Finger; when planted, January, 1929; distance apart, 15 x 15; fertiliser applied, No. 5 (3 lb.), N. soda (1 lb.), super. (1 lb.), muriate of potash (1 lb.); cost of fertiliser per stool, 6¾d.

These plants have made very fair growth, attaining a height of 10 feet before fruiting, the bunches are from fair to good both in size and quantity, suckers profusely and of a very fair type.

Plot No. 6.

Variety, Cavendish; when planted, January, 1929; distance apart, 10 x 10.

This area has received applications of fertilisers, details as to the various ingredients, quantities, and costs per stool are as follows:—

Rows.	Per Stools.
1 and 2—Unfertilised.	
3 and 4—Nitrate soda (3 lb.) .. .. 5—Control.	5¼d.
6 and 7—Superphosphate (3 lb.) .. .. 8—Control.	2¼d.
9 and 10—Nauru phosphate (3 lb.) .. .. 11—Control.	2¼d.
12 and 13—Amm. sulph. (3 lb.) .. .. 14—Control.	6d.
15 and 16—Muriate of potash (3 lb.) .. .. 17—Control.	4½d.
18 and 19—Bonedust (3 lb.) .. .. 20—Control.	3d.
21 and 22—Nauru V amm. sulph (3 lb.) .. .. .. 23—Control.	8¼d.
24 and 25—Nitrate of soda and bonedust (3 lb.) .. .. 26—Control.	8¼d.
27 and 28—Superphosphate and muriate potash (3 lb.) .. .. 29—Control.	6¾d.
30 and 31—Muriate of potash and bonedust (3 lb.) 1-1 .. 32—Control.	3¾d.
33 and 34—Muriate of potash and bonedust (3 lb.) 1-4 ..	4½d.

The rows set apart for fertilising run north and south following a very steep incline with the first six rows of plants occupying land falling towards a stony gully on the western side, whilst on the eastern side of the plot is also a shaley gully or watercourse running from the south-east towards north-north-east, passing almost through the centre of the plot.

Such comprehensive manurial tests as conducted on this site possessing as it does much irregular conditions and qualities of soil, unfavourable gradient and formation when percolation and erosion takes place, it is obvious that any attempt to obtain authenic or reliable information is utterly futile. This fact is further enhanced when particular attention is paid to the untreated rows, where frequently the general appearance of the plants and also the bunches and quality of the fruit

likewise the development and type of suckers produced are observed to be equal and occasionally superior to those growing in rows which have received manurial treatment.

Generally speaking, the plants growing on the eastern and western portion irrespective of treatment are regarded as very fair, whilst those in poorer land and shaley gullies are much inferior. Bunches vary from 7 to 9 hands with bananas from 5 to 7 inches in length. Dusting experiments with copper carbonates for control of leaf spot are in operation throughout this plot under instructions from Mr. J. H. Simmonds.

Plot No. 7.

Variety, Cavendish; when planted, January, 1929; distance apart, 10 x 10; fertilisers applied, untreated.

This plot although untreated will compare favourably with those on the western side of Plot 6, but, however, slightly inferior on the centre area and upper portion where the soil verges into ironbark land.

Plot No. 8.

Variety, cavendish; when planted, January, 1929; distance apart, 6 x 6; fertilisers applied, bonedust (2 lb.); cost of fertiliser per stool, 2d.

This plot is a network of plants, in several instances plants have produced a bunch of bananas when attaining a height of 4 to 5 feet. The plants generally have a comparatively short pseudo stem, although of fairly reasonable girth. The number of plants at present bearing bunches are few, the bananas in some instances compare favourably with those of 10 by 10 spacing, whilst in other instances the actual fruits have a more shrunken or pinched appearance.

Plot No. 9.

Variety, Cavendish, distance apart, 6 x 6; when planted January, 1929; fertilisers applied, untreated.

Comparable with Plot 8; no appreciable difference in quality of fruit and general appearance of plants apparent.

Plot No. 10.

Variety, Cavendish; when planted, January, 1929; distance apart, 9 x 9; fertiliser applied, bonedust (2 lb.); cost of fertiliser per stool, 2d.

A slight improvement is observed in growth of plant and girth of pseudo stem, but very few bunches are produced. Those, however, which are showing appear to be slightly better than those on Plot 9.

Plot No. 11.

Variety, Cavendish; when planted, January, 1929; distance apart, 12 x 12; fertiliser applied, bonedust (2 lb.); cost of fertiliser per stool, 2d.

Owing to a large number of plants failing to grow and replanting having to be undertaken the plants on this plot are not of uniform height. The original plants, however, show a marked improvement both in height and girth and leaf development. Up to the present only a few bunches have appeared, but these are of very fair quality and length.

Plot No. 12.

Variety, Cavendish; when planted, January, 1929; distance apart, 15 x 15; fertiliser applied, bonedust (2 lb.); cost of fertiliser per stool, 2d.

Leaf development, height, and girth of plant show marked improvement over 6 by 6 planting, and are regarded as equal in all respects to the better type of suckers and bunches of those growing on Plot 11, but it is observed that bunches are somewhat slow in development, carrying hands of from 7 to 10 with open fingers of bananas 6½ to 7 inches in length.

PURE MILK.

NECESSARY PRECAUTIONS ON THE FARM.

For pure milk, stated the Metropolitan Dairy Inspector at a recent New South Wales Agricultural Bureau conference, he believed there was every prospect of an increased consumption, but it was necessary to remember what the term involved.

There were times, said the speaker (as reported in Agricultural and Pastoral Notes, issued by the N.S.W. Dept. of Agriculture), when one was forced to the conclusion that the term "pure milk" was in danger of entirely losing its significance, a state of affairs brought about by its free and unrestricted use by every individual engaged in milk distribution. The term could be seen, in the city at any rate, on signboards, billheads, advertisements, and all sorts of milk vehicles, and by its common usage the public had become somewhat indifferent to the value of its meaning. Pure milk was the fresh, unadulterated, and uncontaminated lacteal product of the healthy cow, and it was or should be the ideal of those whose job it was to produce it and those whose duty it was to supervise it and handle it that it should reach the public true to label and not anything less.

A Common Source of Contamination.

Clean and healthy cattle were essential to a pure milk supply, and in this regard the farmer's attention might first be centred upon a very common source of contamination of milk—the soiled body of the cow. Contamination, sometimes of the worst form because it might be pathogenic, was quite possible and had come under notice as a result of the unclean external of the cow. A dairyman needed to be constantly on the alert and to practise every precautionary measure against this form of contamination. Local and climatic conditions naturally played a big part in body soiling; the dairyman's responsibility was always present, but the vagaries of the weather were the governing factors in his methods of combat and control. Dust during continued dry weather was of far-reaching importance, but none the less important was mud during the wet. The position of the udder lent itself to easy external contamination. A herd of cows with well-developed udders was the aim of every progressive dairyman, but the bigger the udder the greater the external surface to deal with. A good, big, well-packed udder was worth the extra trouble, however, and there was no denying the fact that cows were partial to grooming with a soft brush or cloth.

Body soiling occurred in different ways. Amongst the most common was that which occurred on the night camp. It was the practice on many dairies where early morning milking was the rule to keep the cows handy in a comparatively small paddock overnight so that a round-up might be dispensed with in the morning. In cases where hand feeding in the bails was resorted to the cows of their own volition were never far away, and in either case as a result of constant use the ground or the greater portion of it became denuded of grass, and as a result the cows carried in a fair measure of dust or mud, as the case might be. Again, cows that were well fed spent a considerable amount of time in a recumbent position, and might select about the worst place they could for their siesta. Soiling from these causes was thus comparatively easy, and when it was borne in mind that many organisms, some of them disease-bearing, had their habitation in the soil, the necessity for care was evident.

Some Worth-while Measures.

Lack of appreciation of this necessity might indeed prove serious. An excellent precautionary measure was the clipping of the cow's udders. The resultant short hair offered less opportunity for dust or dry particles of earth to adhere, and the udders were easier to clean. Wiping of the udder and contiguous underparts with a damp cloth prior to milking was a simple thing and should always be done. Should mud be adhering, such as might happen in wet weather, the udder must be washed, but must be sufficiently dried and not left sloppy.

Contamination also occurred during wet weather as a result of the drip off the cow's body. Ten minutes under a roof before milking began would give them a chance to drain off, but failing that a scrape down on the milking side minimised the trouble.

Contamination also might occur as a result of scouring, and in this respect the "longtail" was something to be avoided; tails should be sufficiently shortened up. Body soiling after calving, particularly if things did not go right, also often occurred, and the tails and hind parts demanded attention. Contamination from these two last-mentioned causes was very objectionable, and such milk might rapidly develop into a menace, particularly to those of tender years.

WANTED A BETTER CLASS DAIRY COW.

RESULTS of the work of the studmasters of Australia supply ample evidence that the real dairy cow, the cow that produces butter fat at the least cost and returns the greatest profit, is the production of intelligent breeding, feeding, and management. If a cow does not inherit the function of producing a large quantity of butter fat, no method of feeding and management, however expert, can materially increase the yield. Pedigrees of themselves have little influence on the yield of milk and butter that a cow gives, production capacity being an hereditary characteristic. The high-class dairy cow is born with a capacity of giving a large flow of rich milk over a normal lactation period.

Systematic Herd Testing.

The successful breeder becomes familiar with the points and general characteristics of the breed of his choice, and he learns that there is a wide range of variation in production capacity among animals of the one breed. He finds it necessary to study individual animals and by systematic testing determine the production of each cow in his herd. Such information is the basis of assessing production costs—the chief essential in placing this business on a sound financial foundation. The work of recording shows that some dairy farmers obtain as much from one cow in cash as from three other cows fed and cared for in a similar manner. Herd recording enables the dairyman to remove the present burden of a "boarder," whose production is below a profitable basis, and proves the economical advantage of providing suitable fodder, the value of breeding to high class dairy sires, and the real worth of the young stock from recorded dams.

The Choice of a Sire.

Herd recording assists in the choice of a sire which is an important part of a breeder's enterprise, for the success or otherwise of a stud breeder depends to a great extent on the skilful selection of a sire and careful mating. The influence of a sire in a stud or herd cannot be overestimated, for every stud or herd of note has gained its position through the use of high-class prepotent sires. The influence of a number of famous dairy sires is much in evidence to-day through the pre-eminence of studs headed by worthy successors to famous dairy sires of the past whose good influence, through generations of careful breeding, established the law of heredity. In the breeding of dairy cattle it is recognised that production qualities are perpetuated by the use of sires the progeny of dams whose achievements have placed them in a premier position as producers of butter fat.

The all important matter of selecting the sire taxes the skill and judgment of breeders of domestic live stock. Some stud breeders possessed of insight and keen judgment acquired as students of pedigree, conformation, and performance are able to select readily the right class of sire from which to breed. The best of judges may, however, select a sire that does not beget animals of merit. In selecting a sire careful consideration must be given to type and characteristics of the animals from which he sprung. When in search of a sire the experienced breeder is influenced by the quality of the herd that appeals to him and which has produced strong sire lines. In estimating a sire's influence in a herd, attention must be given to the production traits of the female lines in his pedigree, extending over a number of generations. The study of the blood lines of the sire combined with a knowledge of the lines of blood of the females to which he is to be bred, will enable a breeder to select a sire to ensure systematic line breeding which has proved so highly beneficial in establishing many first-class studs. It is through a sire bred on production lines that the desired characteristics are transmitted to his progeny, and herds noted for high production are established. Many of the most successful dairy sires were not up to show ring form, but they all came from good producing ancestry of pure blood lines. The sire that all studmasters and dairy farmers should place at the head of their herds is one possessing a combination of high breeding and production merit. The Pure Breeds Association have on hand an official register of sires possessing such qualifications.

SOME OFFICIAL TESTS.

The dairyman who knows the value of each individual cow in his herd is right on top of his job. Recent official testing results supplied by officers of the Dairy Branch reveal that the cows listed as follows have qualified for entry in the Advanced Register.

SOME OFFICIAL TESTS.

Name of Cow.	Tattoo No.	Period of Test.	Age.	Milk Yield.	Butter Fat Yield.	Sire.	Dam.	Owner.
				Jersey.				
		Days.		Lb.	Lb.			
Lindley's Hope 2nd ..	4	264	Senior, 2 year old	4613	232·296	Lindley's Billy Hughes ..	Lindley Hope	H. Bellert, Gurgeena
Lindley's Handsome 2nd	2	273	Senior, 2 year old	4551·25	225·806	Lindley's Billy Hughes ..	Lindley Handsome ..	H. Bellert, Gurgeena
Hamstead Beryl 2nd ..	1 and 7	273	Junior, 2 year old	5868·625	272·862	Trecarne Cardinal	Beryl 12th of Condamine ..	J. R. Roberts, Toowoomba
Hamstead Gold Spangle..	2 and 7	273	Junior, 2 year old	5307·5	243·781	Trecarne Cardinal	Golden Beauty of Condamine	J. R. Roberts, Toowoomba
Trinity Georgette.. ..	95	273	Mature ..	7732	390·845	Trinity Defiance	Trinity Coral	J. Sinnamon, Goodna
Trinity Orchid	180	273	Senior 2 year old	8196	398·674	Ginger Duke	Trinity Sunset	J. Sinnamon, Goodna
Trinity Lavender ..	186	273	Junior, 2 year old	7762	318·506	Ginger Duke	Brunette of Kardinia ..	J. Sinnamon, Goodna
Trinity Columbine ..	157	273	Junior, 2 year old	7551	433·703	Trinity Governor	Trinity Coral	J. Sinnamon, Goodna
Trinity Meteor	199	273	Junior, 2 year old	5697	302·562	Trinity Governor	Trinity Mystery	J. Sinnamon, Goodna
Trinity Gentle Lady ..	119	273	Senior, 4 year old	8324·5	377·754	Lord Ettrey of Banyule ..	Trinity Jewel	J. Sinnamon, Goodna
Trinity Sultan's Lass ..	H.B. 2453	273	Mature ..	8632	426·786	Trinity Mark of Honour ..	Sultan 4th of Oaklands ..	J. Sinnamon, Goodna
Trinity Daffodil	56	273	Mature ..	8246·75	432·483	Ginger Duke	Beaulieu Netta (imp.) ..	J. Sinnamon, Goodna
Trinity Keepsake ..	195	273	Junior, 2 year old	6228	325·362	Ginger Duke	Trinity Sultane	J. Sinnamon, Goodna
Speck 2nd of Hazelhurst	33	273	Junior, 2 year old	6855·25	411·648	Hadleigh Golden Lad ..	Hazelhurst Milkmaid Speck	C. Austin, Boonah
Shamrock of Glenore ..	62	273	Senior, 2 year old	5089·3	257·281	Safety's Hero of Glenore ..	Shamrock Farm Buttercup	A. F. Birt, Gundiah
College Prism	16	273	Junior, 2 year old	4586·125	217·59	Burnside Defender ..	College Peate	Agric. College, Gatton
Lindley Lady Prim ..	5	365	Mature ..	11092·5	613·444	Bright Star's Prince ..	Miss Prim	A. H. Bulow, Mulgeldie
Lindley Bright Star ..	6	273	Mature ..	7838·75	408·543	Bright Star's Prince ..	Talgai Creamery	A. H. Bulow, Mulgeldie
Starbright of Hazeldean ..	4	273	Junior, 2 year old	4665·25	285·146	Lindley's Bright Lad ..	Lindley Bright Star ..	A. H. Bulow, Mulgeldie
Lindley Creamery ..	12	273	Mature ..	7237·5	384·632	Lindley Waimate	Creamery	A. H. Bulow, Mulgeldie
Belle of Hamilton ..	03	273	Mature ..	7257·25	370·483	Palatine King	Countess of Hamilton ..	H. J. Wilton, Raceview
Cherry May of Pine Hill..	7	273	Junior, 2 year old	4405·25	217·855	Fazelea Peer	Cherry May of Rosedale ..	A. F. Birt, Gundiah
Baby 3rd of Glenore ..	59	273	Senior, 2 year old	5376·3	257·812	Safety's Hero of Glenore ..	Baby of Glenore	A. F. Birt, Gundiah
Storm Queen of Peachester	55	273	Senior, 4 year old	6915·9	376·028	Glengarriffe Nobles Warrior	Maid of the Mist	A. Rough, Peachester
Pineview Buttercup ..	6	273	Senior, 3 year old	7913	481·563	Carnation Lad	Pineview Princess	J. Hunter and Sons, Borallon

SOME OFFICIAL TESTS—*continued.*

Name of Cow.	Tattoo No.	Period of Test.	Age.	Milk Yield.	Butter Fat Yield.	Sire.	Dam.	Owner.
		Days.		Lb.	Lb.			
Illawarra Milking Shorthorn.								
Lovely of Alfa Vale ..	21	273	Senior, 2 year old	8228·875	336·909	Greyleigh of Greyleigh ..	Nellie 4th of Sunnyview ..	W. H. Thompson, Nanango
Nellie 3rd of Sunnyview	43	273	Mature ..	11255·5	452·069	Diamond of Greyleigh ..	Nellie of Bangalow ..	W. H. Thompson, Nanango
Handsome 3rd of Aurora	25	273	Mature ..	10637·75	484·946	Florrie 2nd's Boy of Blacklands	Handsome 2nd of Hillcrest	D. Spoor and Sons, Mundubbera
Emma 11th of Springdale	269	273	Senior, 2 year old	8388·5	323·759	Emperor of Springdale ..	Emma 10th of Springdale..	D. Spoor and Sons, Mundubbera
Favourite of Normanby ..	17	273	Mature ..	10212	473·051	Envoy of Normanby ..	Fancy of Normanby ..	H. Dickfos, Coleyville
Amy of Greyleigh ..	26	273	Senior, 3 year old	9383·5	381·310	Brightlight of Darbalara ..	Amy 4th of Fairfield ..	F. E. Birt, Sexton
Cherry of Lynfield ..	161	273	Senior, 2 year old	8867·35	370·86	Royal Monarch of Blacklands	Damsel of Lynfield.. ..	F. E. Birt, Sexton
Hilda of Mount Blow ..	53	273	Senior, 2 year old	7283·625	270·835	Brilliant of Greyleigh ..	Joyce of Mount Blow ..	Mrs. J. Handley, Murphy's Creek
Violet of Beechwood ..	89	273	Mature ..	9109·8	353·18	Bonnie's Fairfield of Beechwood	Mermaid of Beechwood ..	F. W. Woolley, Moregatta
Pettie 3rd of Springdale..	01	210	Mature ..	9024	369·442	Fussy Knight 2nd ..	Petty 2nd	T. G. O'Meara, Humphrey
Sweetheart of Royston ..	1	273	Mature ..	11696	467·168	Artist of Wunulla	Pettie 3rd of Springdale ..	T. G. O'Meara, Humphrey
Princess 7th of Fairlie ..	137	273	Senior, 2 year old	7833	321·222	Dividend of Rosenthal ..	Princess 3rd of Fairlie ..	C. B. Mitchell, Warwick
Bella 12th of Kilbirnie ..	163	273	Junior, 3 year old	9609	391·861	.. ..	.. ..	Macfarlane Bros., Radford
Buttercup 6th of Burradale	117	273	Mature ..	9730·25	371·561	Kitchener of Burradale ..	Buttercup of Burradale ..	Agric. College, Gatton
Belle of Royston	09	273	Mature ..	9366	382·234	Sherry 2nd of White Park	Bud of Royston	T. G. O'Meara, Humphrey
Mayflower 5th of Rosenthal	317	273	Senior, 4 year old	8375	311·743	Hopeful of Rosenthal ..	Mayflower 3rd of Rosenthal	S. Mitchell, Warwick
Lassie 15th of The Cedars	31	273	Senior, 2 year old	6974·5	269·187	Red Knight of Greyleigh ..	Lassie 5th of The Cedars ..	J. L. Lydnon, Worongary
Polly 7th of Springdale ..	299	273	Junior, 2 year old	8846·25	341·532	Lovely's Commodore of Burradale	Polly 5th of Springdale ..	Hickey and Sons. Wilston
Duchess of Murray's Bridge	20	273	Junior, 2 year old	8286·5	305·041	Valiant of Greyleigh ..	Duchess 4th of Brooklyn Terrace	Hemming Bros., Warwick
Stately of Roselea ..	94	273	Senior, 2 year old	6962·25	275·329	Florrie's Victory of Blacklands	Nutley of Blacklands ..	J. F. Reinke, Mundubbera
Picture 6th of Raleigh ..	9	273	Junior, 4 year old	9804·673	405·526	Democrat of Raleigh ..	Picture 2nd of Raleigh ..	A. J. Caswell, Wangalpong
Rosie 4th of Greyleigh ..	152	273	Mature ..	12957·375	479·211	Joffre of Greyleigh ..	Rosie 3rd of Greyleigh ..	A. J. Caswell, Wangalpong
Friesian.								
Hermoine of St. Gwithian	6	273	Mature ..	13249·5	432·624	Pabst King Pontiac Lad ..	Miss Hook	Hickey and Sons, Wilston
Pontiac College Princess..	D.A. 1	273	Mature ..	13564·5	479·88	Pabst Pontiac Bene Star ..	College Prima Donna ..	Hickey and Sons, Wilston

SHEEP FARMING.

By J. L. HODGE, Instructor, Sheep and Wool.

THE Department of Agriculture and Stock is willing at all times to send an officer to give advice to the small selector on all matters appertaining to the improvement of the block, ring-barking, water, fencing, the erection of permanent improvements, and a lot of other points which, correctly given and faithfully followed, means a great saving in money to the selector, and possibly the difference between success and failure.

Make Haste Slowly.

Too many young men start operations full of enthusiasm, but lacking in judgment. Make haste slowly is sound advice. In the matter of fencing, which undertaken by an inexperienced man can run away with a lot of money without giving the return it should, the selector would be well advised to first of all complete the horse paddock, after picking the best possible position for it, having in mind the enclosure of water without interfering with the supply for the sheep paddocks outside.

Should the natural lay of the land enable one to place the horse paddock somewhere near the centre of the property, the selector is fortunate, for not only does the horse paddock fencing count as part of other subdivisions, but much time is also saved in the course of the year by having the homestead and horse paddock centrally situated. My reason for advising the selector to complete the horse paddock before undertaking any other work is based on years of experience. Too often horse hunting goes on for half a day, which could be so profitably spent otherwise.

If the selector is unmarried, the homestead can be considered later.

Attention should now be given to the boundary. More than likely there are only two sides to fence. This should be completed as soon as possible. Many a selector has had a lift in a financial way by being in a position to take stock on agistment.

Finance.

Having arrived at this point in the development of the holding, the selector should take careful stock of his financial resources. With a horse paddock and boundary completed, one is now in a position to carry some stock. It should now be the object of the owner to make the selection pay for further improvements. Advice with regard to stocking depends to a great extent upon the financial resources of the individual, but for the purposes of this paper we will take it that the selector has his way to make and a rough row to hoe. As before mentioned agistment sheep may be secured. In this case conserve finances with the object at the end of the agistment of being in a position to purchase a small line of sheep. In this connection it is as well to mention here that the Agricultural Bank will advance up to £1,200 for this purpose at 5 per cent. interest to approved applicants, and very liberal terms in the matter of repayments.

Although against a mortgage on general grounds the writer is of the opinion that the selector should at this period of his career on the land make use of the facilities offered.

Stocking.

Then comes the all-important question—"What sheep to purchase?"

If the country is heavily timbered, probably no ring-barking has yet been done, and the land in its virgin state may not be first class. Under these circumstances, I would advise the purchase of a line (to suit the purse) of fattening wethers, the object again being to make the sheep pay for further improvements. Shear these once, and endeavour to fatten with about a four to six months wool.

Where the land selected is improved sheep country I suggest the purchase of a line of ewes for a start, say four to six years old, as the price asked is likely to suit the ability of the selector to pay. In this case make every endeavour to keep the ewe lambs as the basis of a future flock. The greatest care should be taken in purchasing a type of sheep suited to the country and other local conditions. Herein may possibly be the difference between success and failure. If inexperienced, let the selector seek the advice of some old hand in the district, or the services of an officer of the Department of Agriculture and Stock.

Great importance attaches to the sheep to be purchased and, in the case of ewes, the selection of the right type of ram to mate with them.

Let it always be remembered that, apart from the sheep an owner would like to breed, he must, to achieve the greatest success, go for a type to suit his country, rainfall, and local conditions generally.

Quality is important, but the breeder should never lose sight of the fact that constitution is of the major importance. In districts like the west of Queensland, where periodical droughts may be looked for, it is of the utmost importance that the type of sheep bred should be able to stand up to hardships, travel to water, and generally forage for itself. The selector's object should always be to have good sheep. It costs just as much to feed a bad sheep as a good one, and one good sheep, properly nourished and looked after will return as much as two ill-bred and badly nourished animals.

I would always recommend the selector to go after the strong, medium big-framed bold type of merino somewhere about a 60's quality. Having found a type suitable to the country stick to same. A great deal of harm is done to flocks by constantly chopping and changing in the matter of rams. Breed only, of course, from purebred stock, and the longer the pedigree of the animals and the foundation of the stud from which they come the better.

The rams should be slightly stronger in quality than the ewes or the progeny expected. Wool bred in the West has a tendency to fine up with the age of the sheep, and this should be remembered when founding a flock. Having established a flock it should be the aim of the selector to keep them good, and this, apart from general maangement, can be best done by judicious culling.

Before mating the ewes with the rams, go through the former carefully, and reject anything of the type not required, and reject also for any other reason such as malformation, size, want of constitution, &c.

Management.

Management will be learned by careful observation of the methods of neighbours long and successfully established in the district.

Change the sheep frequently from pasture to pasture. Even if, sometimes, a paddock appears to have less feed, the flock will improve.

Watch the condition of the flock keenly, and if a falling off in condition is observed find out the cause quickly.

In these days stomach worms should be watched for. The humped back, white skin, and sickly white in the eye when examined, an inclination to lag behind the rest of the flock, are all symptoms of this disease. Immediate steps should be taken to combat the infestation, and in this connection I would urge the grazier to get in touch with the Department of Agriculture and Stock. The best known drenches and their means of preparation and application to the sheep will be furnished.

Blowfly trouble should be early observed if there, and the treatment at once applied. In the case of these and other diseases or parasites, the Department is always willing to help, and full use should be made of the advice offered.

The Homestead.

If finances permit, consideration may now be given to the homestead. If the property merits the expenditure and if funds permit it is always well to erect a decent house. Apart from the living comforts, a decent homestead always has value in the eyes of a purchaser.

Woolshed and Yards.

Yards and woolsheds are a necessity, and these, too, should be up to the mark. In fact, with all improvements, it will be found economical in the end to make them as good as the property merits. Avoid over-improving. It must be remembered that the money outlay on improvements costs interest, and all should be of such a nature as to earn that interest and merit their existence.

Sheep Shearing.

For the first shearing it would pay the new man on the land to arrange with a neighbour. After getting the clip, combined with the proceeds of the sale of the wethers in the one case or the clip and the sale of the wether portion of the drop in the other case, the selector should be sufficiently strong financially to go on with other essential improvements.

Further Improvements.

Ring-barking where necessary is an economic necessity and should not be neglected. Some subdivision could now be gone on with, and here the greatest care should be exercised in making every panel of fence worth the money expended on it.

Water should have a guiding influence in the matter of sub-division fences.

It should, where possible, be the object of the selector to see that there is water in every paddock. If the country lends itself to the idea, subdivisions may run off the corners of the horse paddock, thus utilising the horse paddock fence in a double capacity. Gates, and good ones, should be erected at suitable places in the fences. It is advisable to make the gates good ones straight away. Too many beginners and others erect temporary (?) gates which stay for years and, apart from being an eyesore, are always a source of annoyance any time sheep have to be shifted.

SHEEP LICKS AND THEIR USES.

By J. L. HODGE, Instructor in Sheep and Wool.

The scientific need of a sheep lick should be determined by proved deficiencies in the soils, pastures, and the water to which sheep have access. This may be determined by analyses of all three.

The greatest proved deficiency in most Australian pastures is lack of phosphates. Therefore the basis of most licks should contain principally a material to make this good. The days when salt only was recommended in season and out of season are passed, and science has stepped in to indicate what ingredients should be supplied.

It does not follow that because a certain lick has proved beneficial to the flock in one district it is going to act in the same manner somewhere else. The main point to keep in view is the condition of the flock. Carefully note any falling off in condition, not attributable to seasonable conditions, and quickly find out the cause. In nearly all cases it will be found that there is some deficiency. This should be supplied with the lick.

When sheep are drinking from an artificial water supply such as bores and wells, analysis will show the amount of salt contained in the water. In prescribing a lick in the case where the water is proved sufficiently saline possibly no salt at all would be mentioned. On the other hand analysis may prove the entire absence of salt. Here the addition of the required amount may form the chief ingredient in the lick. Under drought conditions it is often beneficial to add a protein, such as linseed meal, to the lick.

Taken on broad lines and under adverse conditions, when a lick can be relied upon to do most good the ingredients should consist of phosphates, a protein, a laxative, and a tonic, with the addition of salt, the amount to be governed by the special conditions at the time obtaining.

The practice of feeding a lick to sheep in open troughs is not to be encouraged. Besides the risk of loss by rain, the flocks foul the mixture, making it eventually unfit for consumption.

A Lick Feeder.

The lick feeder recommended by the Department consists of a V-shaped trough with a hinged and covered top. There is an aperture at the bottom of the "V" which automatically releases the lick. A lick board sufficiently broad is attached to the stand about an inch and a-half below the opening and at a serviceable height from the ground. A beaded edge is supplied to save unnecessary waste.

Legislation these days makes it compulsory for the vendors to register their licks with the Department of Agriculture and Stock and to attach a label to each package setting out the contents. Many good proprietary licks are on offer, and the flockmaster proposing to purchase would be well advised to get the opinion of this Department.

During a good season the necessity for a lick decreases, and this is accounted for by the fact that the pastures themselves are supplying the sheep grazed on them with the necessary phosphates and food materials which are usually supplied in a lick when the season is adverse.

Beware of Over-Feeding on Salt.

Beware of over-feeding on salt in the case of ewes in lamb. I think it a good plan to take away most of the salt from a flock of ewes in lamb when half the period of gestation has passed.

The lick as prescribed and containing the salt may be fed to the dry portion of the flock with advantage should the salt be required, but the ewes in the case

stated should be deprived of the salt. The other ingredients may be given to advantage.

It should be the object of the flockowner to have his sheep consume from 2 to 3 oz. of a prescribed suitable lick per week. Ewes rearing lambs require more than dry sheep. Weaners and young sheep, too, could do with more than the dry portion of the flocks.

Rule-of-thumb Methods Out of Date.

It is not sufficient that sheep should be placed on grass irrespective of what that grass contains. It may be a case of starvation or malnutrition in the midst of plenty. It is what those grasses contain in the way of tissue, bone, and body builders which is so important.

The days are fast passing where rule-of-thumb methods may apply to the care and husbandry of sheep. Flocks lose condition, apart from drought, which is unavoidable, and too often the fact is either not noted or casually commented upon. There is a cause for this loss of condition, and it should be the care of every careful flockmaster to ascertain this cause. It will always be found that there is some deficiency, probably of those minerals which are so necessary for the maintenance of the health of the flocks. This deficiency should be detected and the ingredients required made available in the lick.

THE CARE OF THE CAR.

Every motorist will agree that the steering is the most important part of the motor car. A car travelling at 30 miles an hour covers approximately 15 yards a second, and it is very important, therefore, to know that the car is going just where the driver wishes it to. Peculiarly enough, the steering gear is a portion of the car that is most consistently neglected by the owner. Not only is it of vital importance to the safety of the car, but it has a remarkable bearing upon the comfort of driving. Many motorists wonder why an all-day drive is exhausting. However, when the number of steering operations made in a long drive is considered, the reason for physical exhaustion is obvious. There is among motorists much controversy as to what is the most satisfactory type of steering. Some prefer a large movement of the wheel, combined with lightness, whereas others prefer a small movement, even though the wheel be a little heavy to move.

The introduction of balloon tyres has increased greatly the difficulties of steering. The old high-pressure tyre made contact with the road on a very small area of the front wheel. However, the balloon tyre has a large flat area of rubber in contact with the road, and because of its good grip the road wheel is hard to twist, particularly when it is moving slowly.

Due to the introduction of balloon tyres there has been a tendency to reduce the turning circle of the car in the diameter of the minimum circle in which the car can turn. The balloon tyres caused an increase in the turning circle because designers found difficulty in making room for the bigger tyres, when the front wheels were twisted to their maximum deviation from straight ahead. A small turning circle is a great convenience when handling a large car on a narrow winding road. It is also of great use when attempting to park a car in congested streets.

The position of the steering wheel has a great bearing upon the comfort of the driver. The most comfortable wheel is one on which the driver naturally rests his hands. A wheel that is too far forward tires the driver, because he must always have his hands stretched out before him; on the other hand, a wheel that cramps the driver in his seat is insufferable.

The adjustable steering wheel makes for most comfort in driving, as the driver can move the wheel to suit his own requirements.

There are two obvious ways of reducing the effort required to operate the steering wheel. The first is to increase the leverage of the steering wheel over the road wheels and the other is to reduce the friction in the steering gear.

Although increasing the leverage reduces the force required to turn the wheel it carries with it the disadvantage that the steering wheel must be turned through a greater angle for any given movement of the road wheels. In the old days the usual thing was to have the steeding arranged so that one and a-half turns of the steering wheel would turn the front wheels from one lock to the other. Many modern steering wheels require two and a-half turns to do this. This increase in movement is a mixed blessing, as on occasions it is necessary to turn sharply when

only one hand is available for the wheel, and if the driver is not holding the wheel in a convenient position, he is liable to have to take a fresh grip before the turn is completed.

Reversible and irreversible steering are two terms often seen in motor car specifications, that are not always understood. The steering is said to be reversible when movement of the steering wheel will move the road wheels, and any tendency of the road wheels to deviate from the direction set will move the steering wheel. That is, the steering system works both ways. The steering is said to be irreversible when movement of the steering wheel will move the road wheels, but attempted movement of the road wheels will not move the steering wheel—that is, the steering system locks when an effort is made to work it in the reverse direction. An absolutely reversible steering gear would transmit all the sideways bumps received by the road wheels to the driver's hands, and so would make it necessary for the driver to hold the wheel very tightly if it were not to be jerked out of his hands. An absolutely irreversible steering gear, on the other hand, would transmit no road shocks at all through the steering wheel, but would also have no tendency whatever to be self-centring.

The tendency of the steering wheel to straighten up after a corner has been turned is known as self-centring. Some cars can be driven around a corner and then when the straight road is reached the wheel may be released, when it will "pay off" automatically until the car is moving straight ahead again. Such a steering system is truly self-centring, and many cars are fitted with such a steering system. However, in all cars the steering wheel can be returned to centre with much less effort than it takes to deviate the wheel from centre, so that all steering gears are partially self-centring. However, the more a steering tends to be irreversible the less will be the tendency towards self-centring. The designer must make the best possible compromise so that the driver receives only a little of the road shocks through the steering gear and at the same time does not have to exert any appreciable effort to straighten up after a corner has been turned. Some of the more expensive English car makers fit special hydraulic shock absorbers to prevent road shocks from being transmitted back to the driver.

One cause of very heavy steering is friction in the steering box and steering joints. Many motorists neglect the steering gear entirely when lubricating the car. This is probably due to the fact that the steering joints are usually inaccessible and seldom cause squeaks that will draw attention to their want of oil or grease. However, proper lubrication will prevent the steering from becoming unduly stiff and will also prevent excessive wear.

In almost all cars there is a ball joint at the end of the drag link. This ball joint in particular requires plenty of grease, if it is not to be worn quickly. The king pins should also be kept well greased, as the king pins carry a very heavy load which tends to squeeze the grease out very quickly.

The steering box invariably contains a piece of mechanism requiring plenty of lubrication, so that the careful driver should always see that this part is packed with grease or heavy oil. The various mechanisms contained in the steering box for converting the rotary motion of the steering column to the longitudinal motion of the drag link are very ingenious and will be discussed in another article.

In the interests of safety the steering gear should be checked frequently to see that all nuts are tight and all split pins in place. It should not be necessary to say that the steering wheel should never be turned while the car is at rest, for if this be done the steering gear will be strained unduly and possibly damaged.—Radiator in the "Farmer and Settler."

Readers are reminded that a cross in the prescribed square on the first page of this "Journal" is an indication that their Subscription —one shilling—for the current year is now due. The "Journal" is free to farmers and the shilling is merely to cover the cost of postage for twelve months. If your copy is marked with a cross please renew your registration now. Fill in the order form on another page of this issue and mail it immediately, with postage stamps or postal note for one shilling, to the Under Secretary, Department of Agriculture and Stock, Brisbane.

ERADICATION OF DISEASE AMONG PIGS.

By J. A. RUDD, L.V.Sc., Department of Agriculture and Stock, Brisbane.

The eradication of tuberculosis and other diseases in pigs is not difficult if certain very definite lines are followed to that end. The question arises: How does the pig become infected? It is undoubtedly manifest that there are several channels through which infection may be carried to the pig.

(1) Through transmission from parent to offspring.
(2) From milk and other dairy slops.
(3) The use of insanitary feeding troughs and general unclean condition of sties, and faulty methods of construction of sties so that it is a matter of impossibility to keep them clean and wholesome.

Hereditary Transmission.

Transmission from parent to offspring although possible is not a very constant source of infection, and may be dismissed with the observation that all things being equal there is in reality very little chance of infection from this source.

The Bucket.

Milk and other dairy slops are one of the chief sources of infection. Dairy cows all the world over suffer from tuberculosis. At least 2 per cent. of the cows of most herds are liable to spread infection through their milk supply, i.e., they have or are affected with tuberculosis of the udder, and unless this 2 per cent. at least are eliminated the chances of infection are very great. The elimination of this 2 per cent. is not a difficult matter, and it only requires the exercise of a certain amount of intelligence in order to do this successfully. Assuming that this 2 per cent. cannot for various reasons be cut out of the active list of the herd, the other method is to cook the skim milk before feeding it to the pigs. Raising a temperature of 155 deg. Fahr. for fifteen minutes will do all that is required, and not only the pigs but also calves will have the added advantage of being fed on milk which is not only very wholesome but absolutely free from disease. This is not a big undertaking and should be carried out purely as a routine practice, as it eliminates the germs of contagious mastitis, tuberculosis, and contagious abortion in one hit, and also a great many of the so-called diseases of young calves which are largely due to unclean methods of milking and treatment of milk after separation of the cream from the skim milk. The return as a result of immunity from disease will more than repay the added cost of the additional work necessary in order to insure immunity among the small immature stock on the farm.

Filth.

The use of insanitary feeding troughs and general unclean condition of sties and faulty methods of construction of sties make it a matter of impossibility to keep them clean and wholesome.

It is possible to obtain a culture of bovine tuberculosis and other bacilli from the cracks in the end of wooden feeding troughs. If these cracks or crevices are capable of holding such filth it is clearly an impossibility to breed healthy pigs.

If wooden troughs are an absolute necessity, then why not fill up the cracks and crevices with cement and clean them once every week with a strong solution of washing soda? There are certain woods which do not split and crack easily, such, for instance, as the mahogany which, although it will not stand in the ground, is used largely for piles in rivers where borers are prevalent. The erection of suitable pens with impervious concrete floors are an absolute necessity if disease is to be held in check.

The insanitary condition of pig pens. From their construction one is led to think that sanitation was not considered necessary and did not enter into the calculation of those who are responsible for such death traps. Slabbed floors raised off the ground through which excreta and products of decomposing vegetable and animal matter percolates on to the ground below and accumulating there for years is a common spectacle on most pig farms. The pig is securely enclosed in this sty, meticulous care being taken to make sure that all avenues of likely escape from such evil looking and filthy surroundings are completely cut off, with the result that he has to live his normal life surrounded on all sides by a cesspool of iniquitous fermenting filth, the gases from which escaping continuously not only make life a perfect nightmare but must of necessity breed disease, the result of which is only discovered when the returns from the factory disclose the fact. This specious form of cruelty should be discontinued if healthy pigs are to be bred, both for pleasure and for profit.

The Normal Pig.

Given healthy surroundings the pig is normally a hardy, thrifty animal and one that can be depended on easily to make the greatest profit out of the poorest food in comparison with other farm animals.

Breeding from healthy stock which are not inbred does help not only in early maturity but in keeping down disease. The pig is one of the few animals that will not stand inbreeding and whose constitution quickly resents any tricks in this direction. Breeding from immature stock, and this also includes promiscuous breeding, is a factor which cannot be too lightly regarded if success is to be assured in the breeding of pigs for profit.

Selection in Breeding.

The selection of breeding stock is not always attended to with the care that is necessary to guard against predisposition to disease. Knocked-kneed, swampy backed, boars and sows of similar conformation with the additional defect that they are down on their pins (i.e., weak fetlocks) are commonly seen among the breeding stock, with the result that these animals can easily be responsible for a great many of the ills attendant on immature young stock. "Like begets like" is one of the fundamental principles of breeding. This is a golden rule and is generally well known, but it is more often accepted and carried out in the breach than in the observance. So much depends also on the feeding of the parents not only after the pigs are born and still sucking their mother but before there is even a thought of breeding from her. The feeding of the boar is likewise as important, and neglect in this regard is responsible for so many failures—80 per cent. of the partial paralysis of pigs is bred into them by unsuitable mating of faulty parents and with such faults as are easily seen and could be quickly corrected by sterilisation of the unfit. If this was a difficult matter it might easily be overlooked, but as it is one of the everyday operations on the farm lack of care may easily account for a good deal of latent trouble, which manifests itself as time goes on, and the price paid for such neglect is altogether out of all proportion and makes all the difference between profit and loss. There is still another matter which is suggested for serious consideration, and that is the methods which may be adopted with the object of ridding the herd of the 2 per cent. cows which are in most herds and are infected with tuberculosis of the udder.

Getting Rid of the Two Per Centers.

Vaccination of all cows which have mammitis and the elimination of such cows which will not respond to treatment with vaccine, i.e., such cows as will not respond to treatment with vaccine even in as large doses as 20 cc. per day (the treatment starting with 5 cc. of vaccine as first dose) and at seven days' interval. If cows have tuberculosis of the udder there is no response, and if the cow survives the vaccine and if she is badly infected with tuberculosis of the udder she may die under such treatment. If she survives such treatment and still persists with active mastitis she is only fit for the local butcher if she is healthy in other parts of her body, but this is not likely. Therefore the first loss is the best, and she should be shot and burned or buried deeply in some dry soil on the border of the cultivation paddocks. All cows suffering from mastitis should be isolated and the milk buried until such time as the vaccine treatment is carried out, and this could be done by the owner with the assistance, in an advisory capacity, of the Dairy Inspector of the district.

This is suggested as a very good and practical method of ridding herds of the more saturated cases of tubercular disease.

BALANCED RATIONS FOR PIGS.

[*See Plate* 3.]

The six pigs shown in the illustration were litter mates and were "topped up" or prepared for market in a feeding demonstration conducted by the United States Department of Agriculture. The three at the top were fed only corn and a mineral mixture. The three at the bottom were given corn, skim milk, pasture, and a mineral mixture. Skim milk and pasture accounted for the difference. The photograph strikingly illustrates the values of a mixed diet in which the nutrients are balanced, providing not only for the development of fat and bone, but for blood, flesh, muscle, hair, and energy. Pigs fed balanced rations are profit makers, those fed corn alone are decidedly unprofitable and unthrifty. Study the feed and watch the profits grow.—E. J. Shelton, H.D.A., Senior Instructor in Pig Raising.

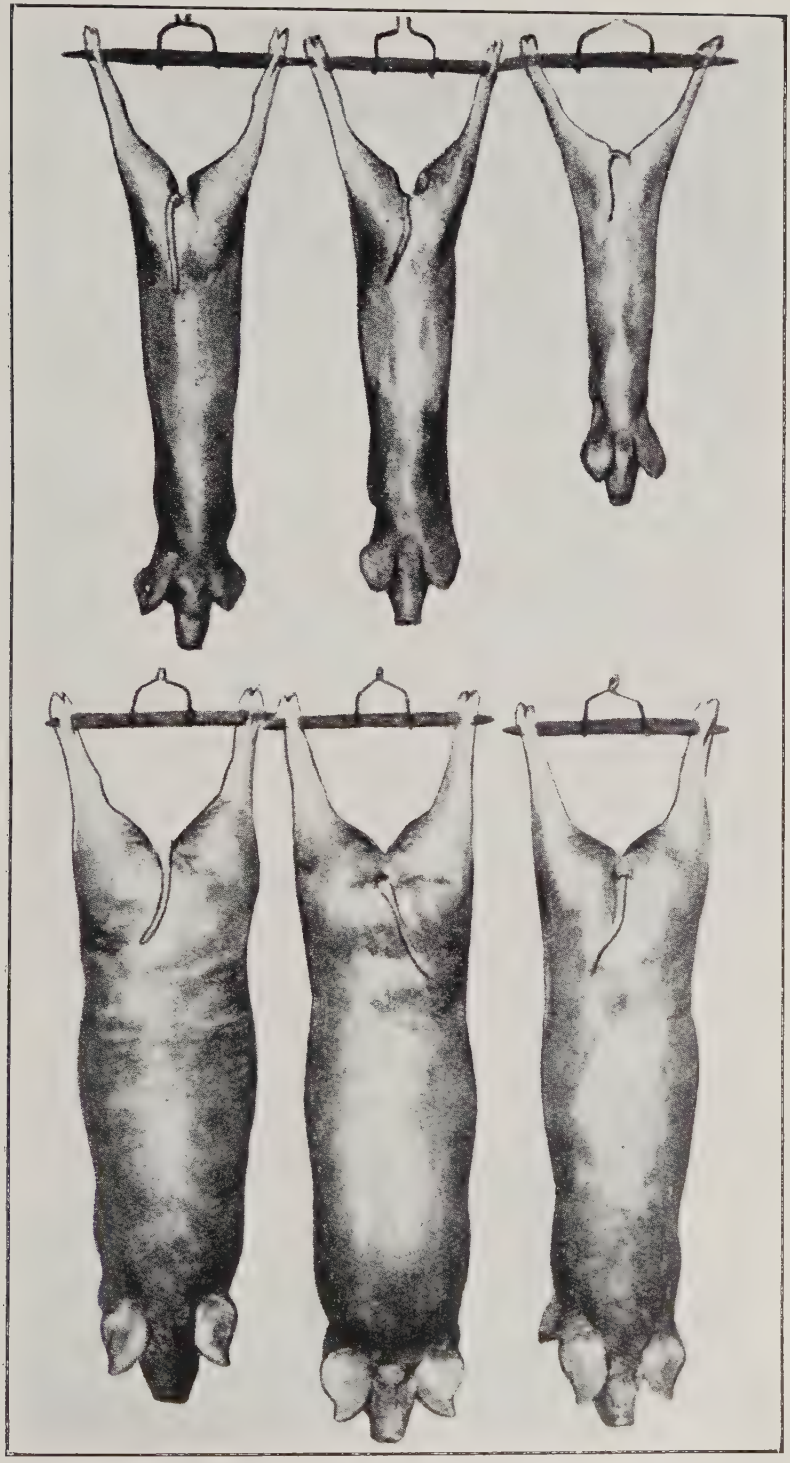


PLATE 3.
BALANCED RATIONS FOR PIGS—PROOF THAT IT PAYS TO FEED MORE THAN CORN TO THESE ANIMALS.

THE PIG FARM.

ACCOMMODATION AND EQUIPMENT.

By L. A. DOWNEY, H.D.A., Instructor in Pig Raising.

The necessity of good accommodation for pigs has frequently been mentioned in educational propaganda in recent years, and we can now say that the majority of pig raisers in Queensland are well aware of the many advantages of having pigs kept under comfortable and hygienic conditions.

Queensland's climatic conditions offer many natural advantages to the stock raiser, the chief of which is the comparatively mild temperature throughout the year, which dispenses with the need for expensive housing to maintain stock in warm conditions during winter months. In these notes Mr. Downey offers many practical suggestions.

THE main objects to be borne in mind when planning a piggery are:—

(1) Sufficient enclosures to keep the stock under control;

(2) Comfortable housing for stock;

(3) Shade during the hottest weather;

(4) Water and food supplies;

(5) Convenience for working the piggery; also

(6) The cost must be carefully watched.

Contrary to the old idea that the piggery was necessarily an objectionable and unsightly section of the farm, this profit-making section can be made attractive and quite inoffensive with comparatively little expenditure, provided that the accommodation for the pigs is set out on correct lines.

The type of piggery to be constructed naturally is determined by the locality, the extent of the pig raising operations, and the nature of the food supply. Most pig raising ventures in Queensland can be classed under the following headings:—

(*a*) Butter-milk piggeries;

(*b*) Suburban piggeries;

(*c*) Slaughter-house piggeries;

(*d*) Agricultural and dairy farm piggeries, and there are a greater number of farmers engaged in pig raising under the last heading, than under the other three headings combined.

Pig accommodation is controlled to some extent by legislation, particularly as regards pigs being kept on slaughtering establishments, butchers' premises, and registered dairy farmers' premises; therefore it is advisable for persons about to construct piggeries or to alter the construction of piggeries on such premises to advise the local inspector, so that guidance may be given for construction in accordance with the Acts concerned. In some shires and municipalities, local by-laws are in operation regulating the building of piggeries, and therefore the Local Authorities should be consulted before building piggeries.

Remembering the many advantages of grazing pigs under what is usually termed the "Paddock System," every effort should be made, in planning a piggery, to provide ample grazing area for all pigs, either on natural pasture or on specially cultivated crops.

Butter-Milk Piggeries.

Under this heading are included some of the largest specialised piggeries in the State. The main source of food supply being the by-products of the dairy factory, this is usually conveyed from the factory to the farm by a pipe-line, although sometimes carted in tanks, and on these farms numbers of pigs ranging from 100 to 1,000 are usually found. These butter-milk piggeries are necessarily situated fairly convenient to the dairy factory, and this must be the chief point in consideration of a site for such a farm, even at the expense of utilising land that is not productive of good crops for pig foods.

However, with most butter-milk piggeries, situated handy to the butter factories, there is ample room for grazing paddocks for the pigs, even though the grazing may not be of the best quality.

On a piggery of this type, where a large number of pigs are to be kept, and it is necessary to economise in labour of feeding, the feeding arrangements must be conveniently situated, and where a large number of pigs are to be brought together for feeding, it is necessary to have concrete floors. Also if the pigs have to be housed together with a large number of animals on a small area of land, it will be necessary to have all their accommodation built on floors of an impervious and solid nature, preferably of concrete. However, in a case of this nature, it would be a distinct advantage to have adjoining paddocks where the pigs could be turned out for exercise.

Where pigs are obliged to remain confined in pens with concrete floors it will be necessary to provide a wooden sleeping platform where the pigs may lie and have no danger of rheumatism which often occurs when pigs are forced to lie continually on cold concrete. This wooden platform should cover a section of the concrete floor, sufficient for all the pigs to lie on, and may either be a movable section that could be removed for cleaning, or it could be made of 1½-in. grooved boards set in pitch and tarred over on top of the concrete.

Although the central pig house is usually to be seen on these buttermilk piggeries, there is no reason why the paddock system with individual houses should not be adopted so as to make fuller use of pastures for pigs.

Suburban Piggeries.

In close proximity to cities and large towns there are piggeries where the waste foods from hotels, boarding-houses, shops, and similar places, are put to good use as pig food. Similar piggeries are also run in conjunction with institutions such as mental hospitals and sanatoriums.

At such piggeries pigs are usually kept on an intensive system, and so well-constructed pens and sheds are built on a comparatively small area of ground. Again, this is only made necessary when land values are too high to permit of grazing paddocks.

Conveniences for cooking the food should be provided at these garbage piggeries and, of course, the peculiar system of feeding will also have some effect on the lay-out of the pens and feeding troughs.

Again, with the suburban piggery where pigs are confined to small pens, it is essential that they should have hard, impervious floors and a good drainage system; also it is necessary to have a plentiful water supply for cleansing purposes.

Slaughter-house Piggeries.

Slaughter-house piggeries are somewhat similar to buttermilk and suburban piggeries in that the pigs are usually kept on the intensive system, and so well constructed houses and pens and impervious floors and troughs are essential to good sanitation.

Boiling appliances are also necessary on the slaughter-house piggery, as all offal and meat fed to pigs must be thoroughly boiled.

In all of the three types of piggeries just dealt with, the fullest possible use should be made of direct sun rays as a disinfectant and deodoriser, also plenty of ventilation should be provided in the houses without allowing direct draughts on to the pigs.

Agricultural and Dairy Farm Piggeries.

This section includes the largest number of pig raisers, as practically every dairy farmer and every mixed farmer keeps at least a few pigs, while some make pig raising a most important section of the farm. The accommodation most suitable on such farms will depend upon the extent of the pig raising operations, but no matter how large or how small the venture should be, it is essential that sufficient accommodation of the correct kind should be provided.

It is most important in planning the piggery that a survey should be made of the extent to which the pig section of the farm may grow, and that the whole undertaking should be planned out on a definite system, because without system the piggery is a muddle. A farmer should reckon out the number of breeding sows he is likely to use and the accommodation he will need for those sows and the boar and their progeny, also an estimate should be made of the amount of grazing and cultivation land that will be required to grow feed for the number of pigs.

In choosing the site for the piggery, consideration should be given to aspect to provide shelter from prevailing winds and to make best use of early morning sun; for these reasons the northerly to easterly aspects will usually be found most suitable. If the paddocks can be made on a slope to give good surface drainage it will be a decided advantage, especially in wet seasons. Where separated milk from the dairy farm is to be used at the piggery an effort should be made to have the piggery situated down the slope below the separating room so that the separated milk may gravitate to the piggery in a line of open galvanised gutter piping, or even if it is necessary to carry or wheel the skim milk from the dairy it is easier to convey it down to the piggery than up to the piggery.

The available water supply, shade, and proximity to cultivation land are other points to be considered.

Although it means economy in fencing to have square paddocks, when pigs have to be fed in their own respective paddocks it would mean carrying food too far to each trough, and for this reason the piggery will be more convenient to work if long, narrow paddocks are provided. However, the paddocks should be large enough to allow of cultivation if necessary, also large gates or movable hurdles may be used at one end of the paddocks to allow entry of horses and implements.

Fig. 6 showing the layout of a piggery with sufficient paddock and shed accommodation for six sows and a boar and their progeny (up to six months of age), will be found a most convenient and suitable system for many dairy and agricultural farms. This system provides a paddock for dry brood sows, a small paddock for the boar, two paddocks for sows with litters until they are weaned, and four paddocks for growing pigs. These paddocks should provide ample room for running the pigs in small numbers, and one of the paddocks could occasionally be utilised for cultivation of crops to be grazed off by the pigs.

The system aimed at in this lay-out is to have the six sows divided into three lots of two, having two sows to farrow every two months; this can be fairly well regulated when the boar is kept in a separate pen from the sows, and it gives more control over the breeding and provides a regular supply of pigs throughout the year, particularly when crops are grown regularly to supplement the milk supply. Thus there is always ample grazing room for all pigs, and faster gains are made by the stock and losses from disease are minimised.

Although the sheds shown in this plan are double sheds placed over the dividing fences, other individual sheds, either fixtures or movable, on skids, could be used. Concrete feeding floors and troughs are shown, but although these are most satisfactory they may be replaced by well-made wooden troughs.

All the paddocks are shown leading out into a cultivation paddock at the bottom of the run, such a paddock cropped with lucerne to be either grazed off in sections by the pigs, using movable hurdles to control the feeding-off, or to be cut and thrown over to the pigs in their runs, provides a very valuable food supply for the pigs.

With all piggeries a convenient loading arrangement is a necessity, and so provision must be made for either a portable or a fixed race to run the pigs from the yard into the cart or lorry. The accompanying plan of the dairy farm piggery provides for a 16-ft. laneway leading to a loading race at one end, and with movable hurdles for moving pigs from one paddock to another or up to the loading race.

Quarantine Pen.

It is advisable to provide a quarantine pen some distance from other pens, where newly introduced pigs and sick pigs could be placed and kept under observation. This is an important safeguard against outbreaks of disease.

Sheds.

There are numerous types of sheds suitable for different piggeries, and the type most suitable to a particular farm will have to be determined by the farmer, and conform with his local conditions. Certain requirements are general in all piggeries, firstly, the size. A shed suitable to use for a sow and litter or about ten growing pigs, or a boar, or about four brood sows would need to have a floor space of approximately 8 by 8 feet, but extra space in a shed is an advantage, also, with larger sheds, temporary partitions can be used to provide a number of separate sections. The height of pig houses should be sufficient to allow a man to move about inside without difficulty; nothing under 5 feet is satisfactory.

Considering Queensland's warm climate, ample provision should be made for ventilation, and yet there should be no cracks about the lower portions of the sheds to allow direct draughts to blow on to the pigs and cause chills.

It is advisable in planning pig houses to so arrange walls and doors as to have direct sun-rays into every part of the floor where practicable, and for this reason the open-fronted shed faced to the north-east can well be recommended. In some particularly wet districts, however, it may be necessary to have the front of the shed practically closed to prevent drifting rains from wetting the sleeping floor.

In selecting materials for building pig houses, the costs of various suitable materials will largely influence their choice, but in general corrugated galvanised iron roofs, wooden walls, and floors of concrete and wood or wood alone will be found most satisfactory.

Central Pig Houses.

These are found to be most suitable for buttermilk piggeries, slaughter-house piggeries, and suburban piggeries. Figs. 2, 3, 4, 5, and 9 illustrate this class of building which is of a more solid and permanent structure than small individual houses. In this type of pig house where large numbers of pigs are to be fed, impervious floors, preferably of concrete with wooden sleeping platforms, are essential. There should be a sanitary drainage system, and all drains should be shallow, smooth, and free from corners, and open to the sunlight, also the drainage must be delivered away to where it will not cause a nuisance.

In the large central pig houses where there is continual dampness around the feeding troughs, the use of concrete walls is very beneficial as they withstand the moisture better than do wooden walls.

Outdoor Double Sheds.

This type of shed, although different in many respects to the central type of house, has the idea of making one large shed do the work of two small sheds and thus saving one end wall, as it is only necessary to have a low partition between the two sections of the shed. This type of shed, as shown in figs. 12 and 13, is very useful under the paddock system; it is easily constructed and, where the paddocks are large, there is no necessity for special drains with this shed; this also applies to the smaller single sheds.

If it is necessary at any time to lock pigs in the open-fronted shed, a temporary hurdle can easily be erected along the front.

Pig houses with wooden floors should have the floors built from 6 to 12 in. off the ground in order to keep them dry and so that the ground under the floors may be kept sanitary.

Outdoor Single Sheds and Portable Sheds.

These are similar in design to the double sheds except that being complete for each paddock the sheds may be placed away from the dividing fences.

When the single shed is to be used in pig paddocks the best method of building same is to put it on runners, that will serve a double purpose of keeping the floor

boards up off the ground and also the runners can be used as skids; thus the shed is portable, and could be hauled about the farm with a team of horses or a tractor. This practice has many advantages and, for most Queensland pig raisers, this type of single portable house will be found the most serviceable.

Portable houses can be moved from one paddock to another when crops are being grazed off by pigs, and the shed can easily be removed from one part of a paddock to another, in order to sweeten up the ground or to allow cultivators to work.

Guard Rail.

All farrowing houses should be fitted with a guard rail to prevent young pigs from being crushed against the walls. Experience has proved that the use of this rail has saved an appreciable percentage of young pigs. This rail can be constructed of 3 by 2-inches hardwood, 1-inch water piping, or saplings. It should be placed 9 inches above the floor and 7 inches from the walls.

Fences

The class of fence to be used on each farm will be governed mainly by the available material for its construction.

Pig fences need to be from 2 feet 6 inches to 4 feet in height, depending on the class of pigs to be enclosed. Large boars and sows sometimes have a tendency to jump fences, and for such animals a 4-feet fence would be necessary; however, a fence 3 feet high is usually sufficient to control pigs of all sizes, while young pigs are usually kept in their places by 2 feet 6 inch fences. To overcome this difference in the required heights of fences posts should be put 4 feet out of the ground so that the height of the fence may be raised to 4 feet, if necessary, by the use of extra barbed wire.

With pig pens it is a fairly constant rule that the smaller the pen the more substantial fences must be, the reverse also holds.

It is usually advisable to have a line of barbed wire, either on the ground level or a few inches below to prevent pigs from rooting under fences; logs or stones can sometimes be used to the same purpose.

The posts of pig fences should never be placed more than 10 feet apart, and 8 feet would be better. Several types of fences are satisfactory under certain conditions:—

Post and three-rail fences are most serviceable for large pigs, and can be made proof against small pigs by the addition of wire netting 18 inches high. This fence, however, is only suitable where timber is cheaply available and where there is not so much risk of fire and white ants.

Posts and wire netting alone seldom make a good fence except for weaner pigs, as the wire sags and is easily torn by large pigs. However, wire netting of stout gauge is useful in patching up other fences, such as ordinary cattle fences, to make them pig proof.

The post and two-rail fence covered with split or sawn palings is suitable for some piggeries. The palings should be strapped on with hoop iron at the top and bottom. As is the case with all wooden fences, there is a danger of fire and white ants. The paling fence has the advantage of acting as a break-wind in the piggery.

The other type of paling fence where either sawn or split palings are used and are held in position between two interwoven plain wires at the top and bottom of the posts is very common and very useful where timber is plentiful. Saplings or slabs may also be used in the same fashion, interwoven with the two wires top and bottom. Perhaps the most satisfactory fence for pig paddocks is woven wire, which can be purchased at reasonable prices from hardware stores. Woven wire is made in various designs and especially for pig paddocks, some having a barbed wire at the bottom. The height of woven pig wire is about 2 feet 6 inches; this is sufficient for young stock, and if it is desired to increase the height of the fence, extra barbed wires may be placed above the woven wire. The panels of woven wire should not be more than 10 feet.

The use of a few extra barbed wires is to be recommended on the fence of the boar pen.

A fence made of seven or eight barbed wires suitably placed on the posts is fairly satisfactory, but it is objectionable where young pigs are penned as a scratch from barbed wire is often carried by the young pigs to the bacon factory, and there shows up as a disfiguration on the carcass. Where wire fences are used it is advisable to either reinforce them or replace them by wood at the feeding end of the paddocks as there is most wear and tear on this part of the fence.

Troughs.

The piggery should be equipped with troughs of sufficient capacity to feed the pigs without undue scrambling or fighting at feeding time, that is, sufficient space should be provided at the trough for each pig, an average space of 10 inches should be allowed for adult pigs. Also troughs should have the capacity to hold a full feed for the pigs.

Pig troughs should be strongly constructed and have a smooth surface free from corners or cracks. Where portable troughs are made they should be of a size which allows of them being easily carried on to new ground. With stationary troughs it is essential that they should be built on to a floor of concrete or brick to prevent the pigs from making an objectionable mud wallow beside the trough. Wooden slabs placed on the ground beside the feeding trough are very unsanitary even if they do keep the pigs out of the mud. Spilt food and drainage collects under the slabs and causes an objectionable odour. The feeding floor should always be of an impervious nature.

The most serviceable troughs are of concrete built into a concrete floor as shown in fig. 26.

The trough illustrated in fig. 26 is 14 feet in length and the width is 15 inches overall, having its sides of 2½-inch thickness, reinforced with barbed wire, lengthways. The trough is 5 inches deep and the inside width is 10 inches. The platform is 7 feet wide and 16 feet long and 4 inches in thickness, and is surrounded by a protective flange 4 by 2-inch hardwood, bolted together at corners to protect the edges of the platform from being broken away.

Improvements could be made to such a trough by making a bung in the end leading outside the pen to facilitate cleaning the trough. Also, if the end of the trough was projected outside the fence, food could be poured in from the outside. Iron bars of ½ inch thickness set into the concrete across the trough 10 inches apart prevent the pigs from fighting at the trough and also prevent pigs from rooting food out of the trough. In such a trough it is preferable to have all the internal corners rounded off in order to facilitate cleaning.

Movable troughs built of concrete are very serviceable in some circumstances.

The V-shaped wooden trough, as illustrated in fig. 27, is a very useful trough when concrete cannot be used. This type of trough can be made of varying sizes to suit requirements. One suited to general use is made of a 9 by 1 inch hardwood board and an 8 by 1 inch hardwood board secured by screwing or nailing together at right angles and the ends closed up by 9 by 1 inch hardwood boards. The timber must be sawn and tightly fitted to prevent leakages. A dressing inside and out of tar acts as a preservative on the wood, and also makes it watertight and more hygienic.

Cast and galvanised iron troughs of various designs are procurable from hardware stores, and these are quite satisfactory under certain conditions.

Self-Feeders.

In an interesting and informative article which appeared in the November issue of the "Queensland Agricultural Journal" in 1927, Mr. F. Bostock, now of the Hawkesbury Agricultural College, New South Wales, stated that—

A "self-feeder" is simply a device by means of which a supply of grain or other feeds may be kept constantly available to the pigs in order that they may satisfy the cravings of their appetites.

Self-feeders, as illustrated, are practicable when grain is being fed, and for this purpose are intended for use more especially during the growing and fattening stages in the life of the bacon pigs, and are not specially recommended for use in feeding breeding sows, though even for this purpose the self-feeder may be used, but if so used the mixture of foods should be more nitrogenous (flesh-forming) than is usually given to baconers. This is because breeding sows in general only require a limited allowance of grain.

The two types of self-feeders, as shown in the plans (figs. 32 and 33), should be built on skids or runners to prevent pigs rooting at the floors and to facilitate moving. If strongly constructed this method of transport will be found to be much easier and quicker than loading the feeder into a wagon or on to a sledge.

Self-feeders should be designed primarily to keep an available supply of grain constantly before the pigs, and at the same time protect the contents against waste due to wind and rain.

It consists of a hopper to hold the food and a trough below, into which the grain is allowed to flow, the sliding and hinged flaps regulate the amount of grain permitted to flow into the trough as the pigs eat it.

The hopper is made sufficiently large enough to hold several days' supply of feed, and the inside walls should be as smooth as possible in order not to prevent the flow of grain into the trough.

When it is desired to feed two or more foods separately in the same self-feeder, a partition may easily be placed in the hopper at any distance from either end.

The self-feeder should be placed on a wooden or concrete platform if possible, and if well constructed with first-grade timber and given a coat of paint about once every twelve months should give service for quite a number of years.

According to American experiments there is very little doubt which method is the more economical, and as shown by the results of a number of experiments the self-feeder system is advantageous in every respect. Its use results in larger daily gains in live weight, bringing the pigs to marketable weights at an earlier date, and although the feed is consumed more rapidly there is an actual saving in the amount of feed required to produce 100 lb. of gain. This is a fact of extreme importance and is well worth consideration.

Last, but not least, one of the advantages to be gained is the saving of time and labour. At the same time the farmer must not neglect the self-feeder; because he has filled the hopper with grain he cannot afford to forget about it. The old adage, "The eye of the master fattens his cattle," holds good when applied to the self-feeding of pigs. There are a number of things which may happen to the self-feeder if left without attention. For instance, the feed may block in the hopper, thus leaving the pigs with a "dead" self-feeder, or the feed may become soiled in the trough, making it unpalatable to the pigs.

A self-feeder is by no means a substitute for the knowledge of feeding. The self-feeder may be adapted to the feeding of any kind of grain, although shelled grain and ground foods are most commonly used. It may be used to feed maize on the cob, but in this case the feeder would be required to be of a larger size than shown in accompanying plans in order to hold sufficient grain to feed a number of pigs for several days without refilling.

Maize meal or barley would require a smaller opening to prevent too rapid a flow of grain than would, say, whole maize. It will be noted in the plans that the sliding and hinged flaps have been fitted with thumb screws so as it may be adjusted to suit the type of grain being fed.

Shades.

Pigs should be provided with ample cool shade in hot summer months, and this can be done by either planting shrubs or hedges or by building a framework of 3 by 2 inches hardwood and covering the top with bushes or thatching with grass. Where a clump of natural scrub can be left in the pig paddock, good shade is provided where the pigs can burrow away into the cool and sleep during the hottest part of the day.

Oiling Post.

An occasional application of oil to the pig's skin keeps it in a soft and healthy condition, and at the same time the oil destroys lice and other external parasites on the pig. A convenient self-oiler can be made by wrapping a bag or a rope around a post or a tree in the runs from the ground level up to a height of 2 feet, the bagging or rope is kept saturated with oil, and the pigs oil themselves by rubbing against the post. A mixture of six parts of waste oil and one part of kerosene is very suitable for oiling pigs.

[Photo. by courtesy of Principal, Dookie Agricultural College, Vic.

PLATE 4 (Fig. 1).

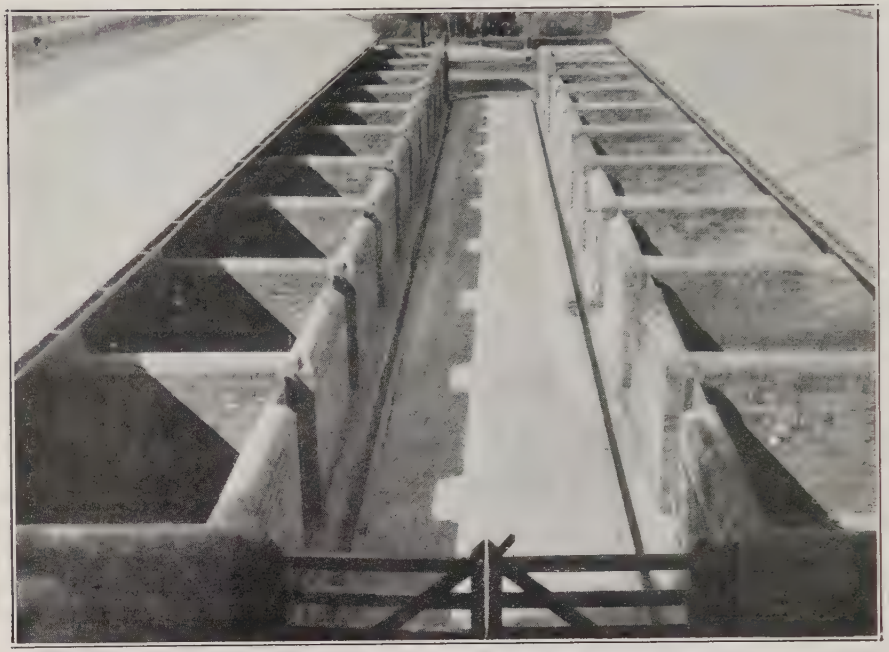
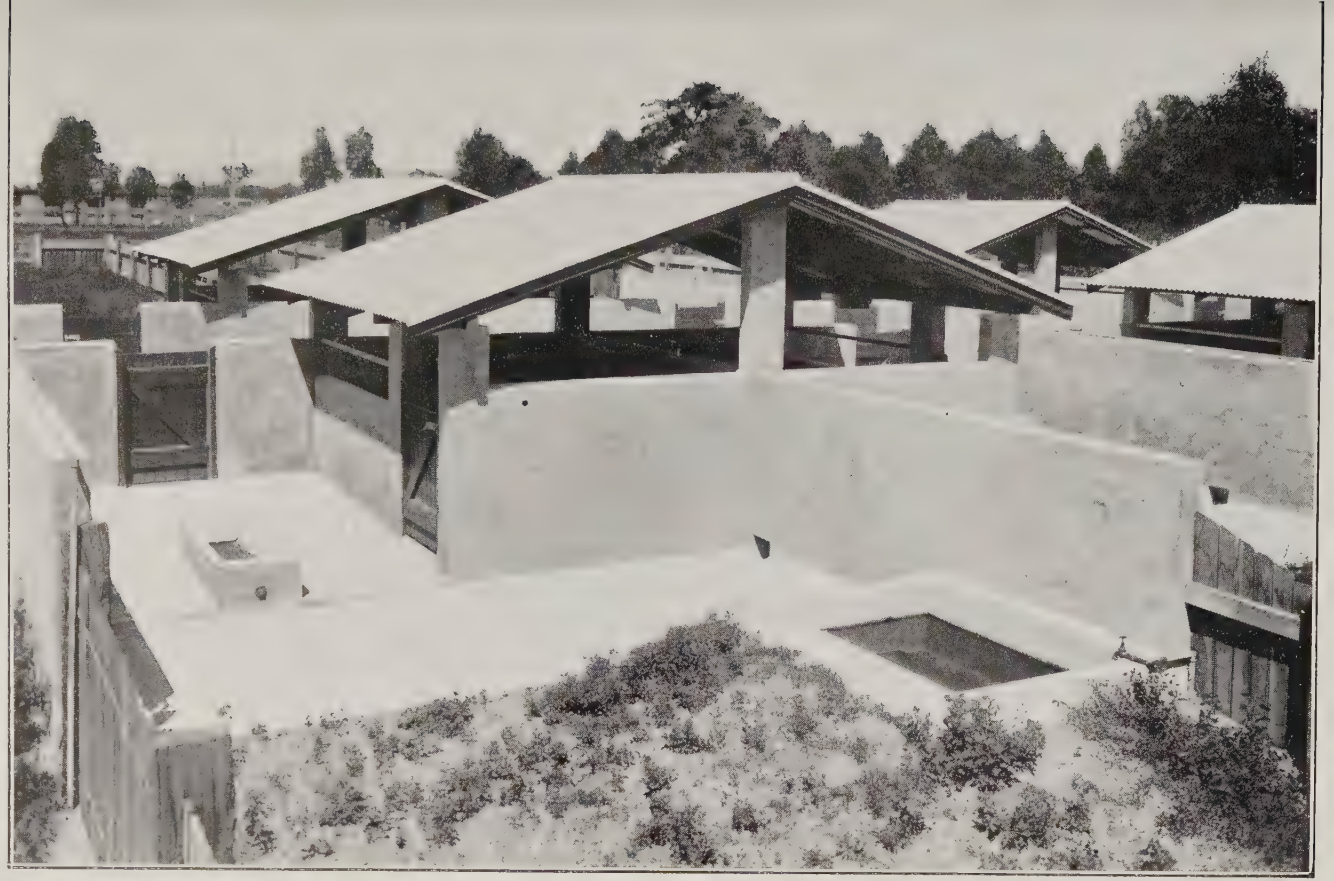


PLATE 5 (Fig. 2).
Piggeries, Mental Hospital, Goodna, Queensland, showing brick and concrete feeding pens, pathway, and drains.

PLATE 6 (Fig. 3.)
Piggeries, Mental Hospital, Goodna, Queensland, showing exercise yards and shade at the rear of feeding and sleeping pens.



[*Photo.*: *N. S. W. Government Printer.*]

PLATE 7 (Fig. 4).

Section of Concrete Piggeries at the Hawkesbury Agricultural College, Richmond, N.S W. This type of Piggery is suitable

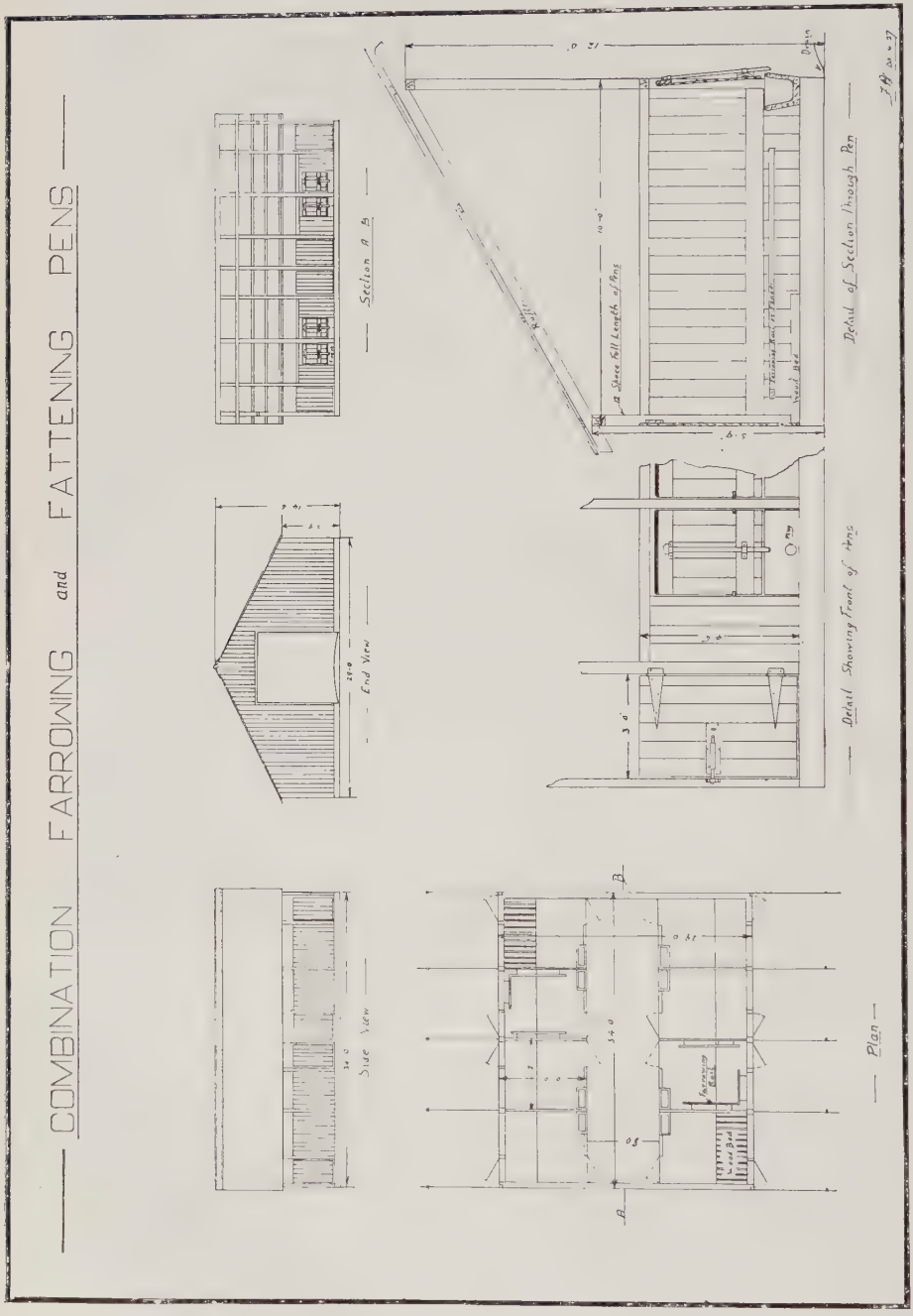
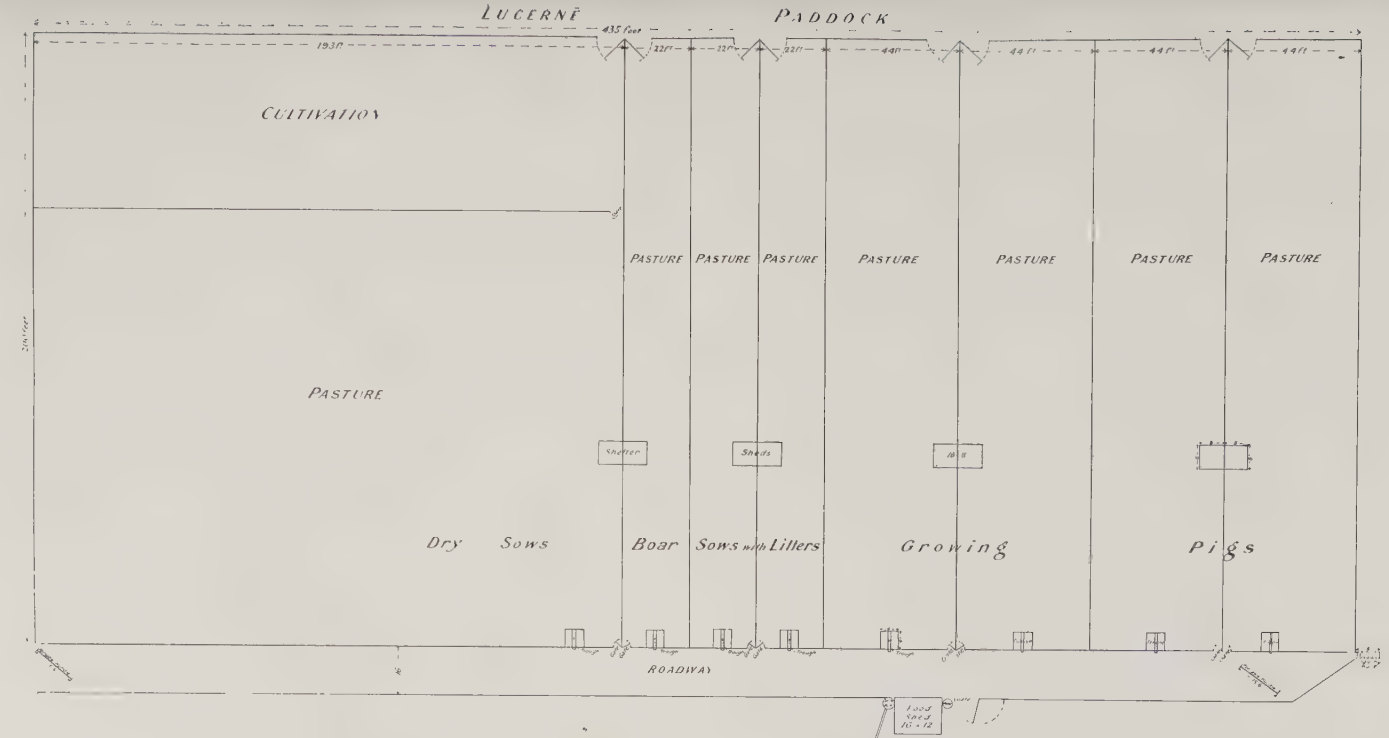

COMBINATION FARROWING and FATTENING PENS
Section A B
End View
Side View
Plan
Detail Showing Front of Pens
Detail of Section through Pen

PLATE 8 (Fig. 5).



PLAN OF PIGGERY

For Six Sows, One Boar & Young Stock

(Approx 2 Acres Grass Land)

PLATE 9 (Fig. 6).

PLATE 10 (Fig. 7).

A section of the piggery at the State Farm, Kairi, Atherton Tableland, North Queensland, where pigs are run on lucerne and grass paddocks and provided with individual shelter sheds.

PLATE 11 (Fig. 8).

A useful type of portable loading race.

Plate 12 (Fig. 9).

The central pig house in use at the Mental Hospital, Goodna, Queensland. This house has two rows of pens, with a passage and drains down the centre.

Plate 13 (Fig. 10).

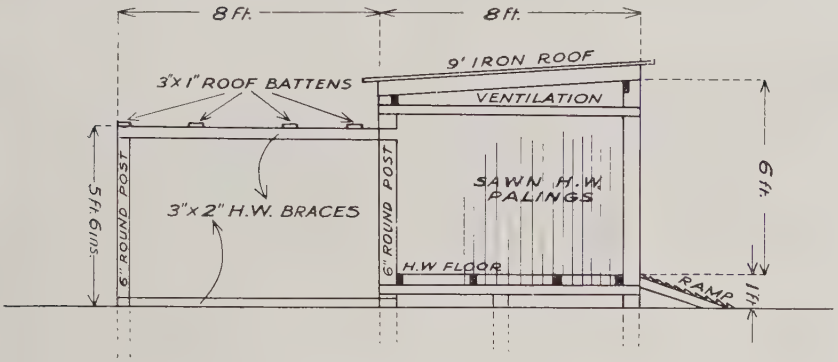
An attractive pig shed and yards on a Queensland farm.

PLATE 14 (Fig. 11).

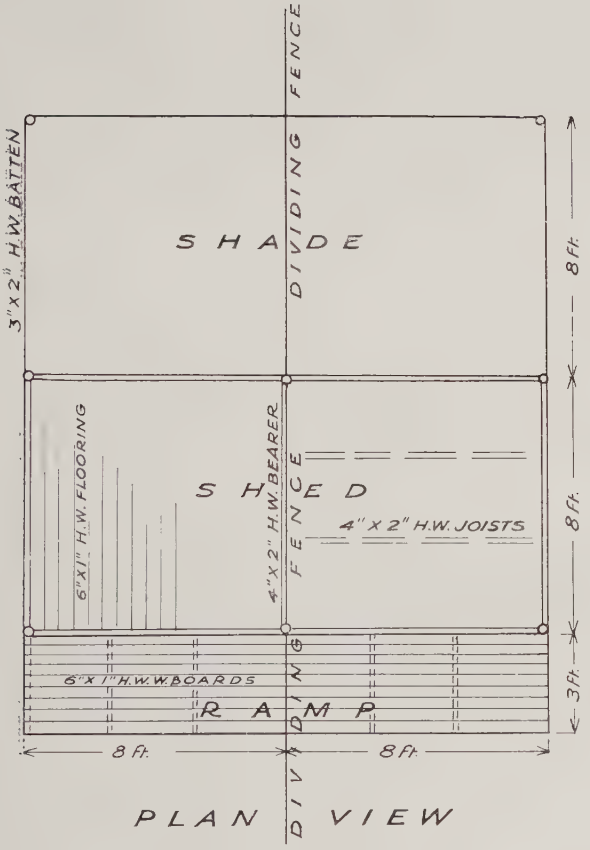
Pig shed at the Kairi State Farm, Atherton Tableland, North Queensland. On account of the wet climate in that region the front of this shed is partially closed. It will be noted, however, that ample ventilation space is provided at the top of the walls.

PLATE 15 (Fig. 12).

Double Pig Shed, divided by fence, at the Hawkesbury Agricultural College, Richmond, N.S.W. Note also the well constructed fences and shade trees for comfort of stock



END ELEVATION



PLAN VIEW

OPEN FRONTED SHELTER SHEDS FOR PIGS
Being a Double Shed with a Dividing Fence
Ramp in Front and Brush Shade at Back

PLATE 16 (Fig. 13).

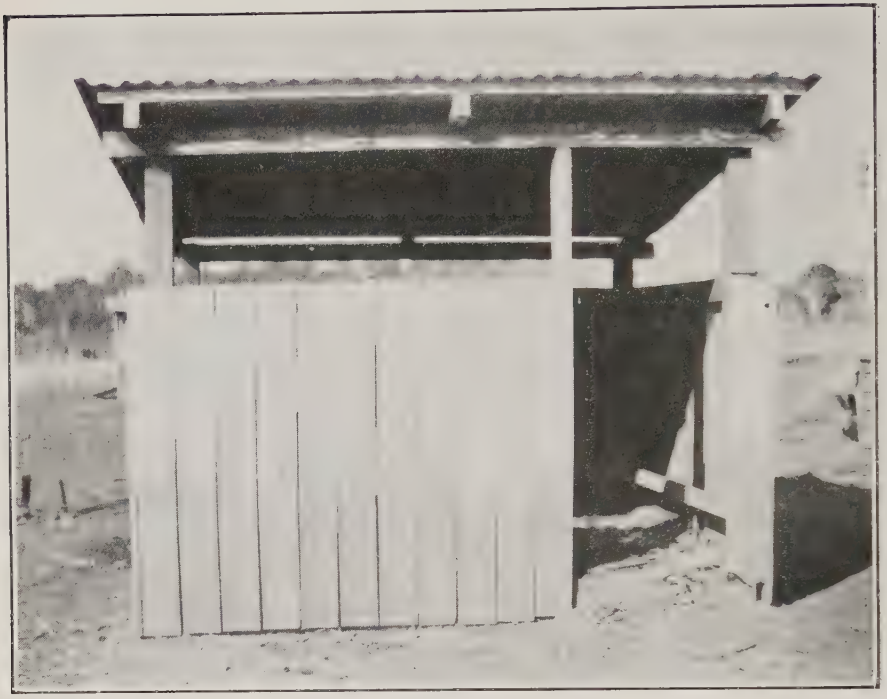
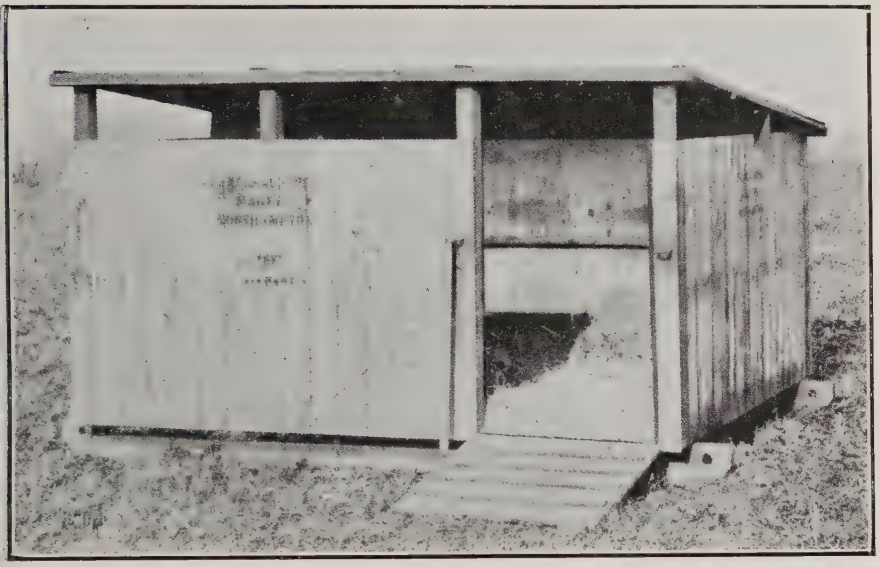


PLATE 17 (Fig. 14).
A single shed in use at the State Farm, Kairi, North Queensland. This shed is a fixture; its measurements are:—Floor, 9 ft. x 9 ft.; front, 6 ft. high; back, 5 ft. high.

PLATE 18 (Fig. 15).
A neat set of Single Sheds on the farm of W. Koehler, Yamsion, *via* Dalby, Q.



[*Photo.: Ministry of Agriculture and Fisheries, Pig Keeping Publications, London.*]

PLATE 19 (Fig. 16).

Portable Pig Shed photographed on an English farm. A convenient type for Queensland conditions.

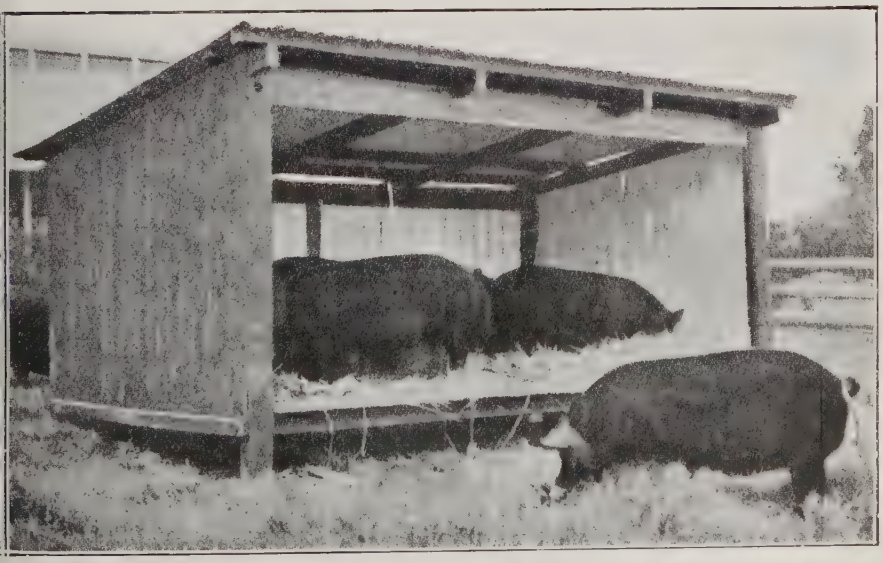
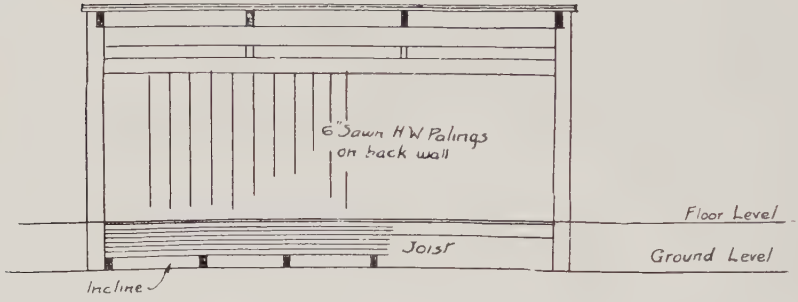
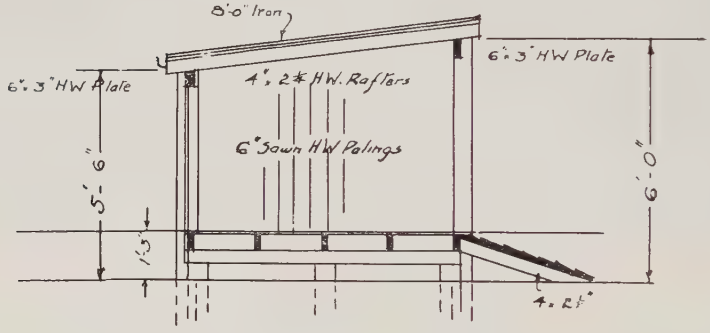


PLATE 20 (Fig. 17).

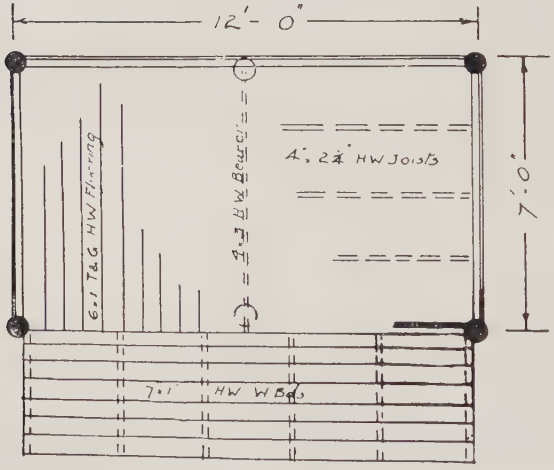
Open-fronted shelter shed at the Hawkesbury Agricultural College, Richmond, N.S.W. Berkshire Sows enjoying the advantages of this type of shed, which is suitable for most Queensland Pig Farms.



FRONT ELEVATION



SECTION



PLAN

PLATE 21 (Fig. 18).
Plan for shed as shown in Figure 17.

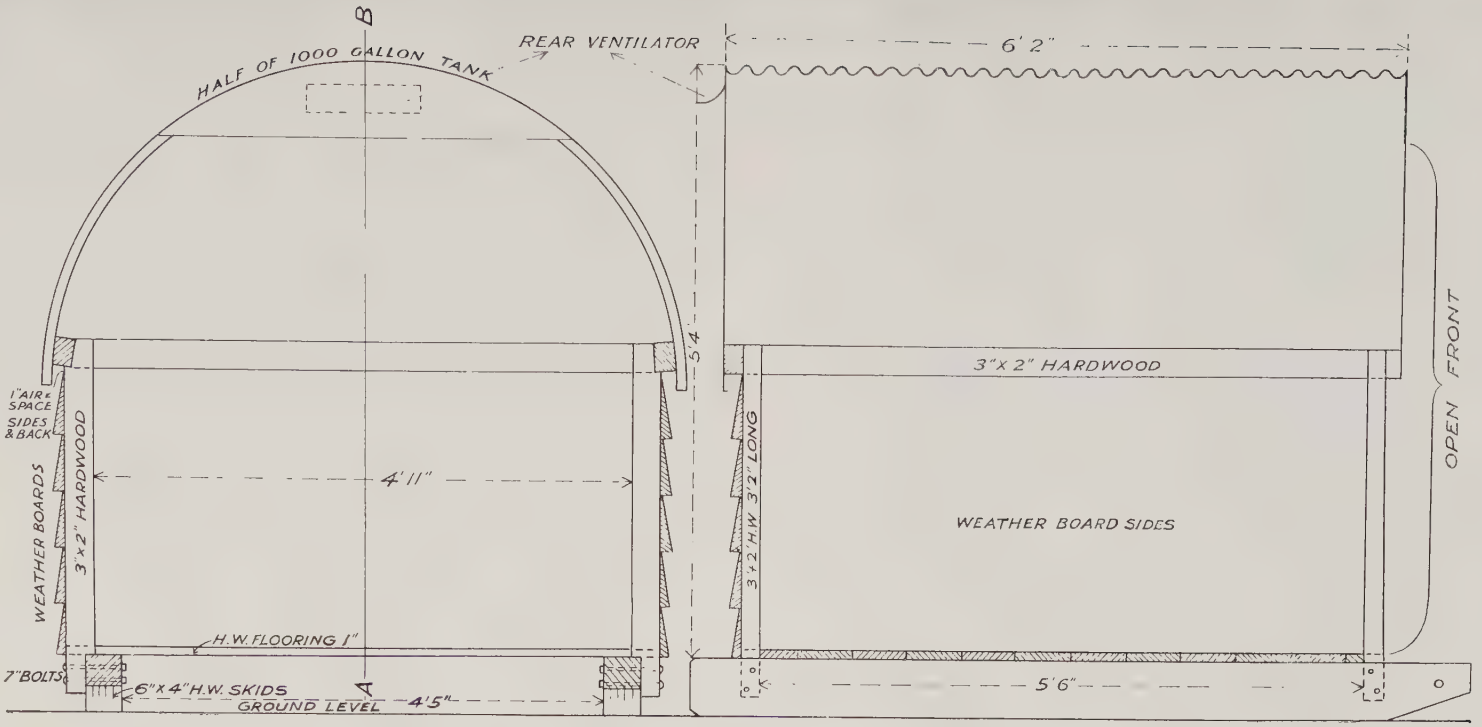


PLATE 22 (Fig 19.)—PLAN OF A PORTABLE SHELTER SHED, USING HALF A WATER TANK.

PLATE 23 (Fig. 20).
A substantial pig fence of three rails, made to hold young pigs by the addition of wire-netting to a height of 18 inches.

PLATE 24 (Fig. 21).
Woven wire fence strengthened by the addition of wire-netting and barbed wire.

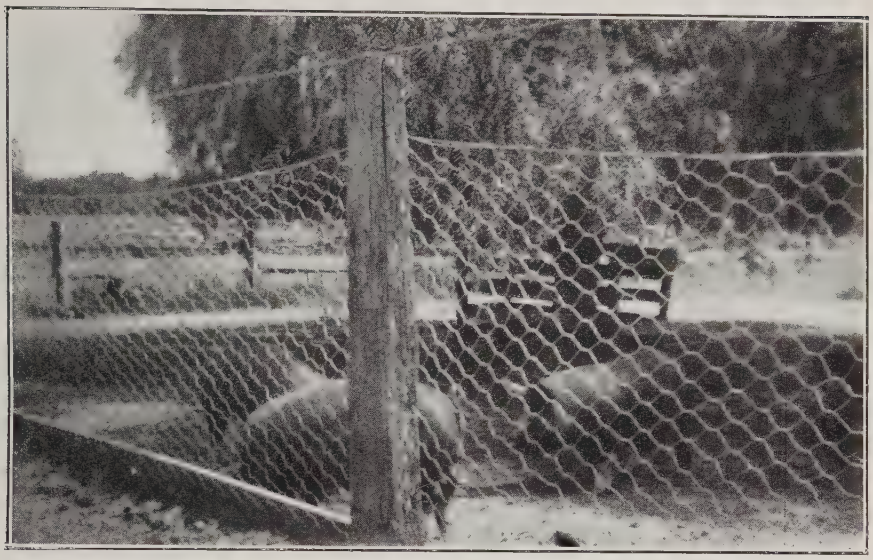


Plate 25 (Fig. 22).
Wire-netting fence, useful for enclosing small pigs.

Plate 26 (Fig. 23).
A most serviceable fence of two rails and sawn palings. This class of fence can be used to advantage for small yards or enclosing large pigs.

PLATE 27 (Fig. 24)

This fence is made of 7 plain wires and a barbed wire at the bottom, posts are 10 feet apart, with four wooden droppers to each panel. It is suitable for holding large pigs, and the plain wires being through the posts can easily be strained when necessary.

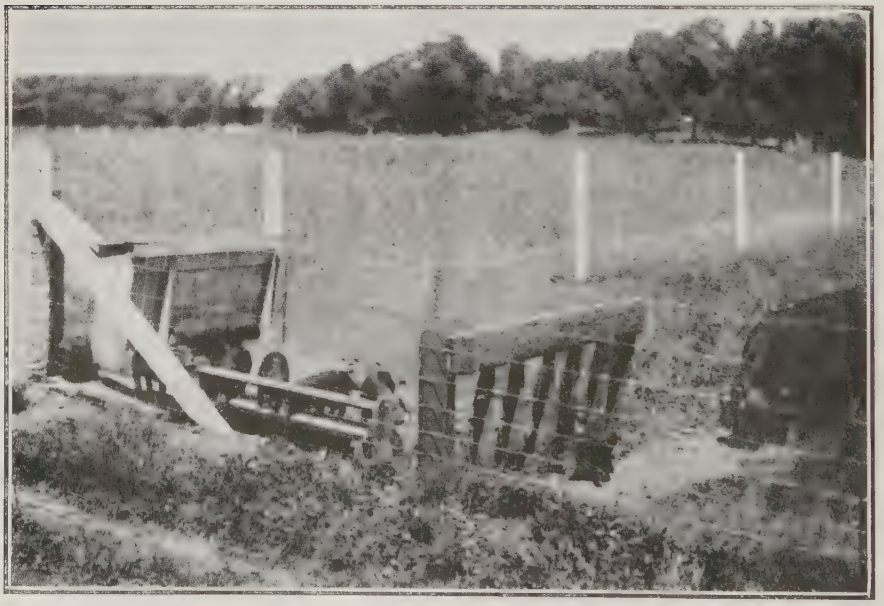


PLATE 28 (Fig. 25).

A Woven Wire Fence.—Note the wooden creep for feeding young pigs apart from the sow. This creep is so constructed that the suckers can get into the feeding pen, but the sow is blocked out; this permits of the suckers being fed a little extra food prior to weaning.

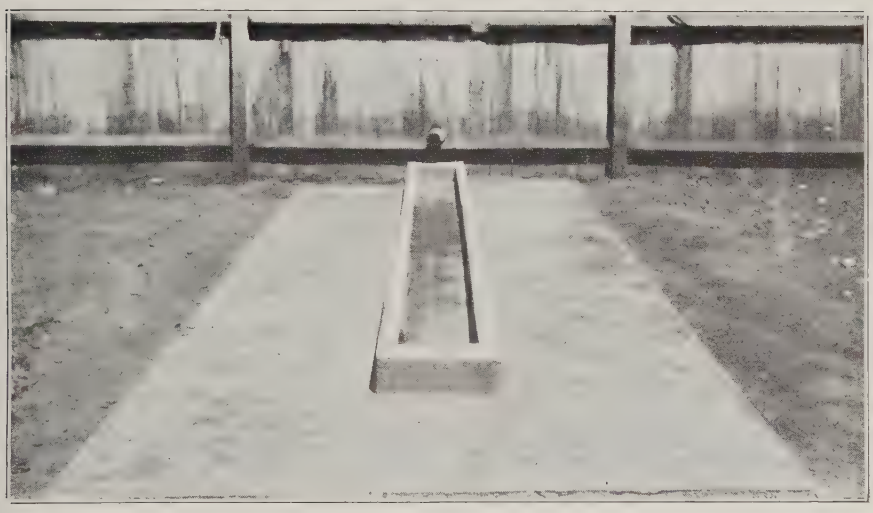


Plate 29 (Fig. 26).
Concrete food trough and platform.

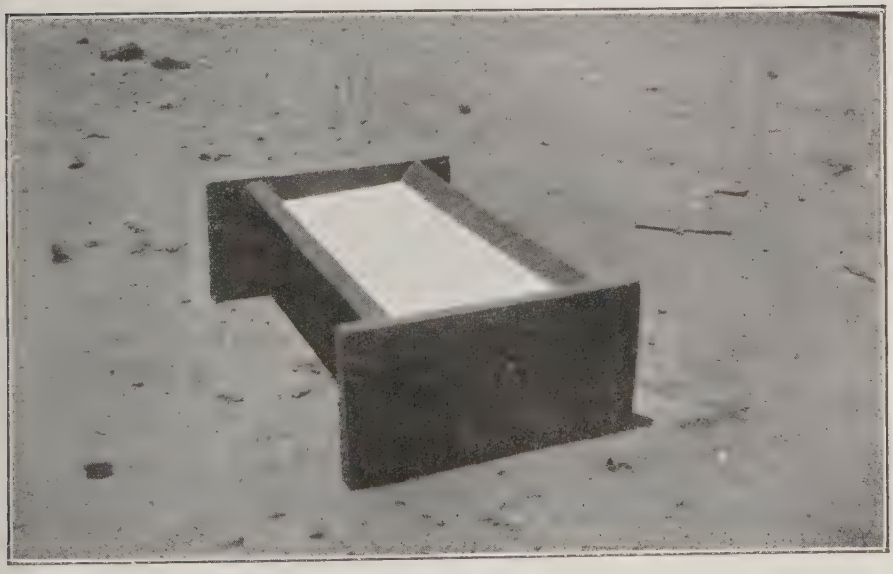


Plate 30 (Fig. 27).
Breakfast is served. A handy V-shaped wooden trough.

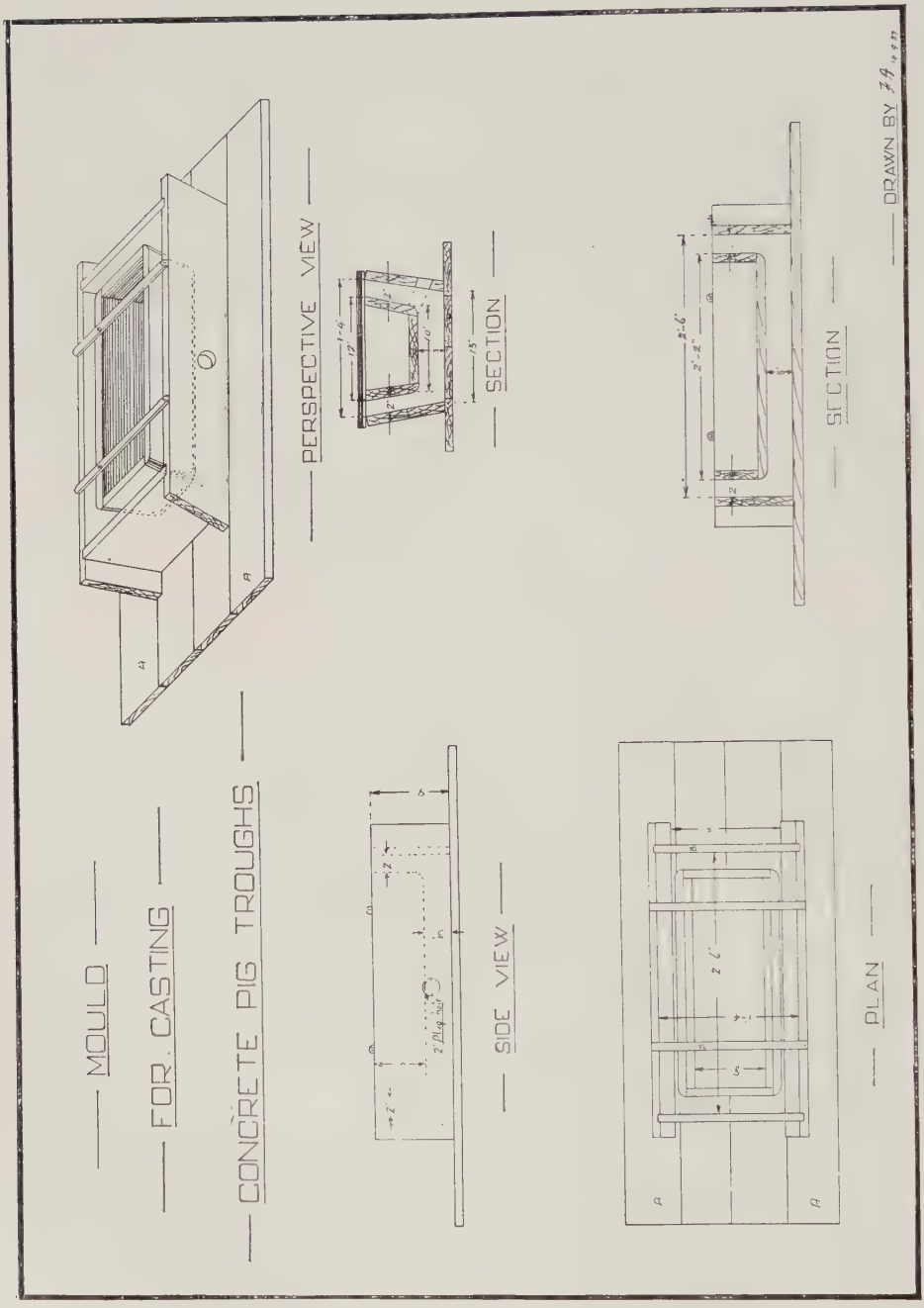


PLATE 31 (Fig. 28).

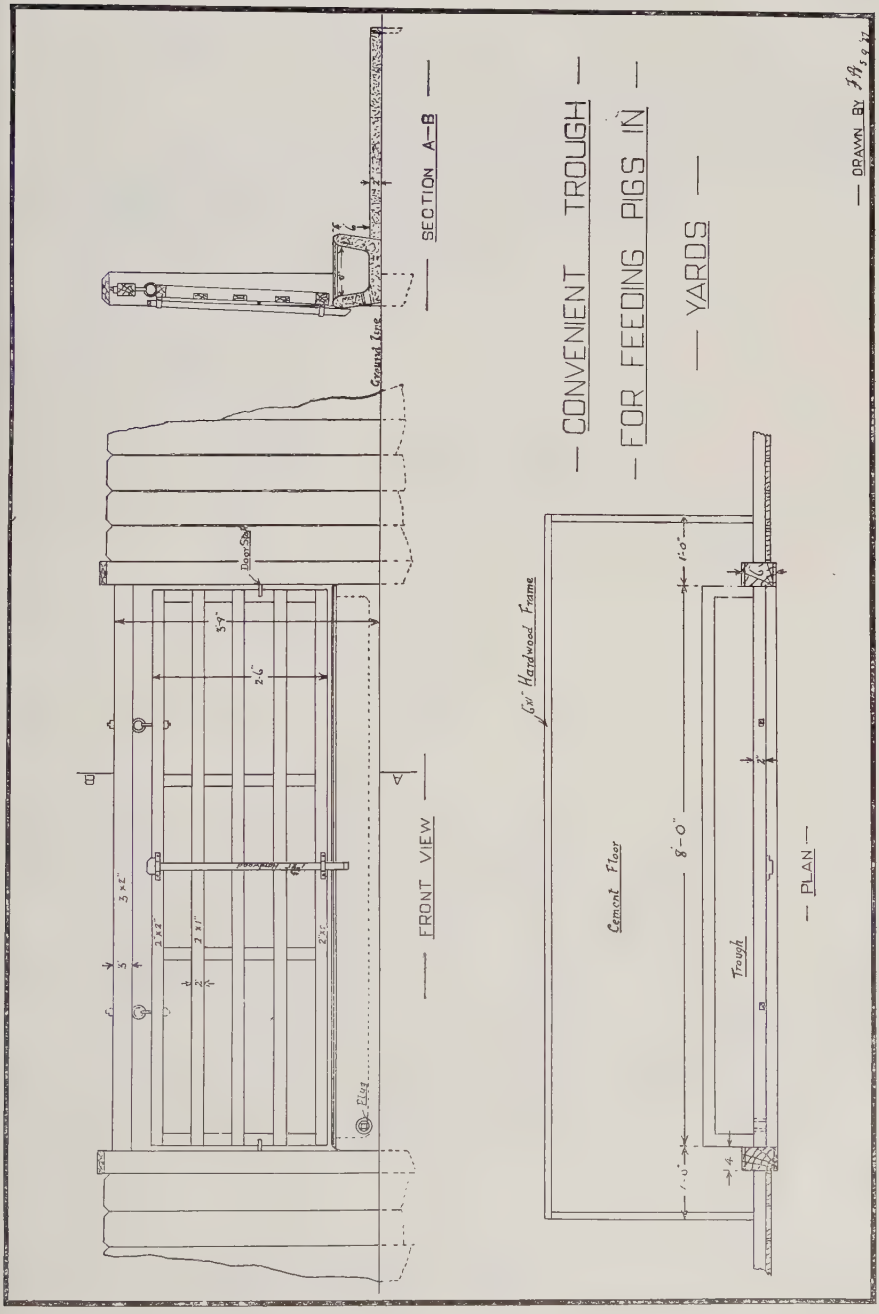


Plate 32 (Fig. 29).

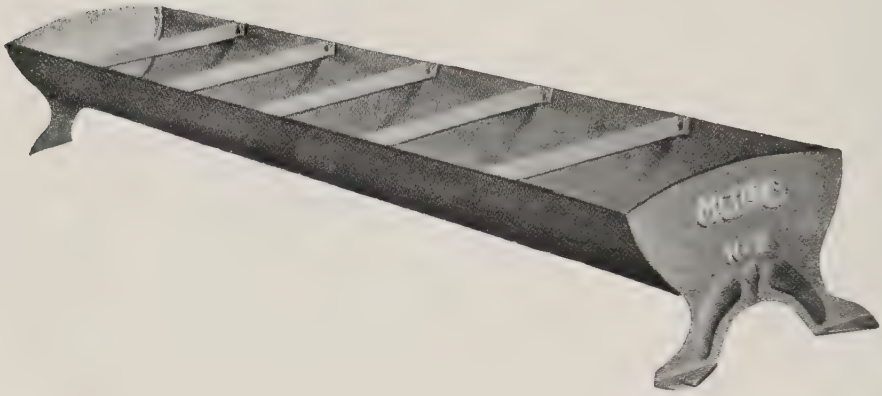
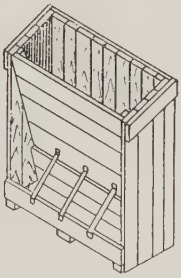


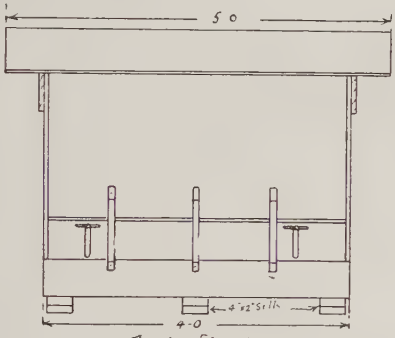
PLATE 33 (Fig. 30).
Steel pig trough, with cast iron ends, for feeding six pigs. Weight is about 40 lbs.

PLATE 34 (Fig. 31).
Feeding time for the Pig Farm Pets.

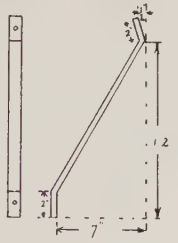
ONE WAY SELF FEEDER FOR PIGS



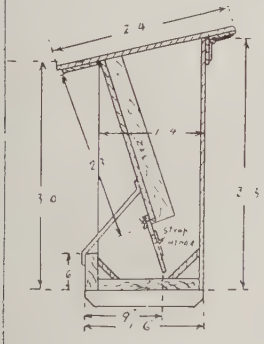
Perspective with Roof Removed



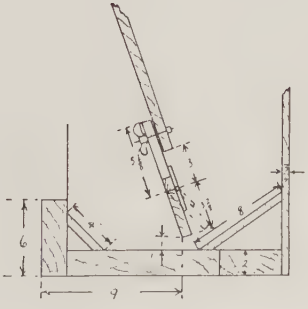
Front Elevation



Detail of Iron Strap



Section

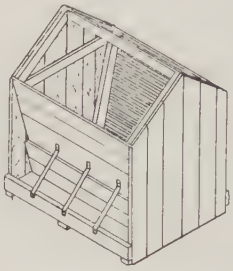


Detail of Slide and Hinged Flap

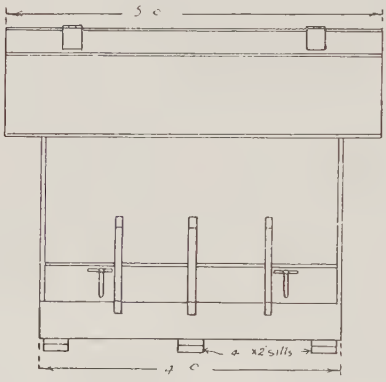
Drawn by J.R.

PLATE 35 (Fig. 32).

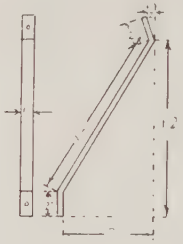
TWO-WAY SELF FEEDER FOR PIGS



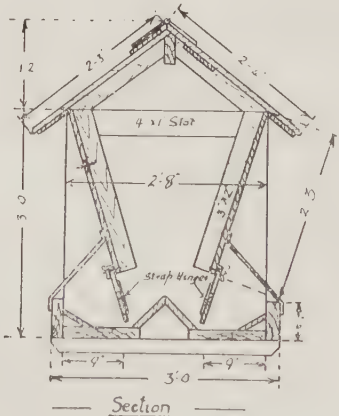
Perspective with Roof Removed



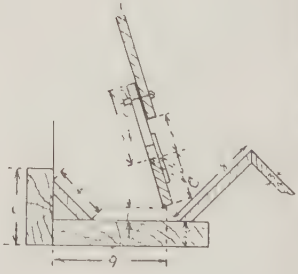
Front Elevation



Detail of Iron Strap



Section



Detail of Slide and Hinged Flap

Drawn by J.B. 31.8.26

PLATE 36 (Fig. 33).

One-way Self-feeder for Pigs—Material Required.

Plate 35 (Fig. 32).

Members.	Number.	Length.	Size.	Material.
Skids	Three	1 ft 6 in.	4 in. x 2 in.	Hardwood
Trough	One	4 ft.	6 in. x 2 in.	Pine
Trough	One	3 ft 10½in.	12 in. x 2 in.	Pine
Trough	One	3 ft. 10½in.	4 in. x 2 in.	Pine
Trough	One	3 ft. 10½in.	8 in. x ¾ in.	Pine
Trough	One	3 ft. 10½in.	4 in. x ¾ in.	Pine
Front Panels	Five	3 ft. 10½in.	6 in. x ¾ in., T. & G.	Pine
Front Panels	Two	2 ft. 3 in.	3 in. x 2 in.	Pine
Sliding and Hinged Flaps	Two	3 ft. 10½in.	4 in. x ¾ in.	Pine
Ends and Back	Twenty-four	3 ft. 3 in.	6 in. x ¾ in., T. & G.	Pine
Ends and Back	One	7 ft.	6 in. x ¾ in.	Pine
Top	Ten	2 ft. 4 in	6 in x ¾ in., T. & G.	Pine
Top	Two	5 ft.	6 in. x ¾ in.	Pine

Hardware.

Three 1-inch by ¼-inch iron straps.
Six 3-inch strap hinges.
Two 3-inch by ½-inch bolts with thumb nuts
Nails, &c.

Two-way Self-feeder for Pigs.—Material Required.

Plate 36 (Fig. 33)

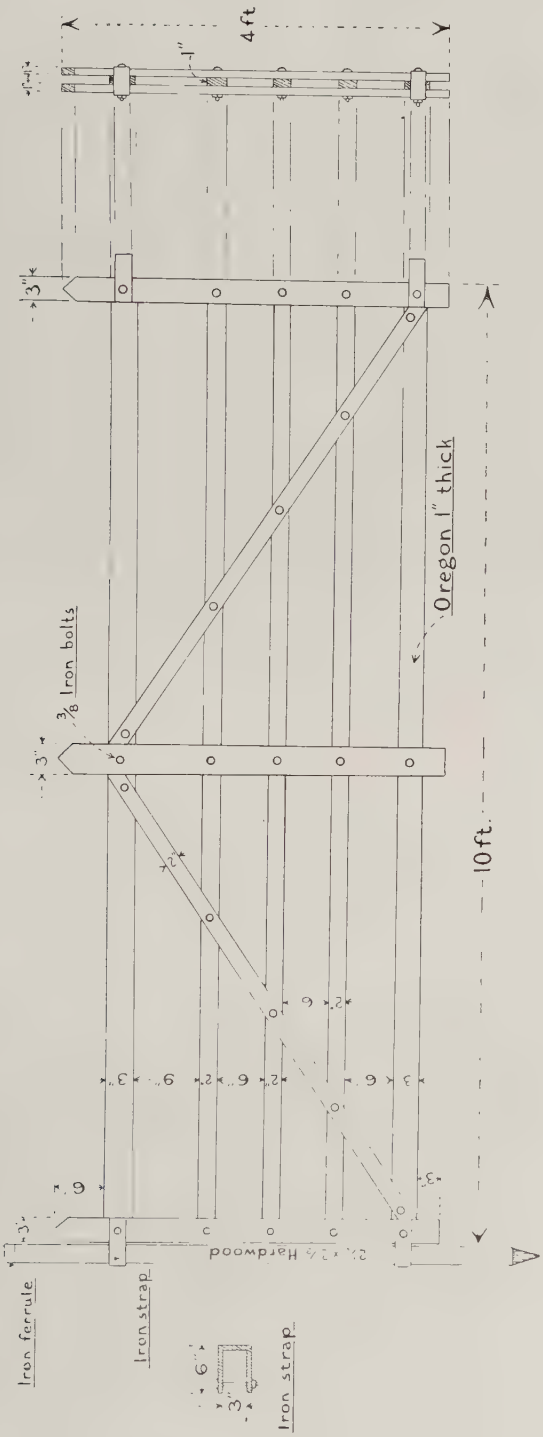
Members.	Number.	Length.	Size.	Material.
Skids	Three	3 ft.	4 in. x 2 in.	Hardwood
Trough	Two	4 ft.	6 in. x 2 in.	Pine
Trough	Two	3 ft. 10½in.	12 in. x 2 in.	Pine
Trough	Two	3 ft. 10½in.	8 in. x ¾ in	Pine
Trough	Two	3 ft 10½ n.	4 in. x ¾ in.	Pine
Panels	Ten	3 ft. 10½in.	6 in. x ¾ in., T. & G.	Pine
Panels	Four	2 ft. 3 in.	3 in. x 2 in.	Pine
Sliding and Hinged Flap	Four	3 ft. 10½in.	4 in. x ¾ in.	Pine
Ends	Twelve	4 ft. 2 in.	6 in. x ¾ in., T. & G.	Pine
Frame of Roof	One	4 ft.	6 in. x 2 in.	Pine
Frame of Roof	Four	1 ft. 9 in.	3 in. x 2 in.	Pine
Frame of Roof	Two	2 ft.	4 in. x 1 in.	Pine
Roof	Twenty	2 ft. 4 in.	6 in. x ¾ in., T. & G.	Pine
Roof	Four	5 ft.	6 in. x ¾ in.	Pine

Hardware.

Six 1-inch by ¼-inch iron straps.
Eight 3-inch strap hinges.
Two 5-inch strap hinges.
Four 3-inch by ½-inch bolts with thumb nuts.
Nails, &c.

PLATE 37 (Fig. 34).
Self Feeders on an American Pig Farm. Note that the feeders are placed on wooden platforms for cleanliness.

PLATE 38 (Fig. 35)
Self Feeder on Skids ready for Transport.



Movable Pig Hurdle

Scale: 3/4" = 1'

PLATE 39 (Fig. 36).

PLATE 40 (Fig. 37).
Berkshire Sows enjoying the shelter provided by the Budelia shrub at the Farm Home for Boys, Westbrook, *via* Toowoomba.

PLATE 41 (Fig. 38).
Shady pig yards at Hawkesbury Agricultural College, Richmond, New South Wales.

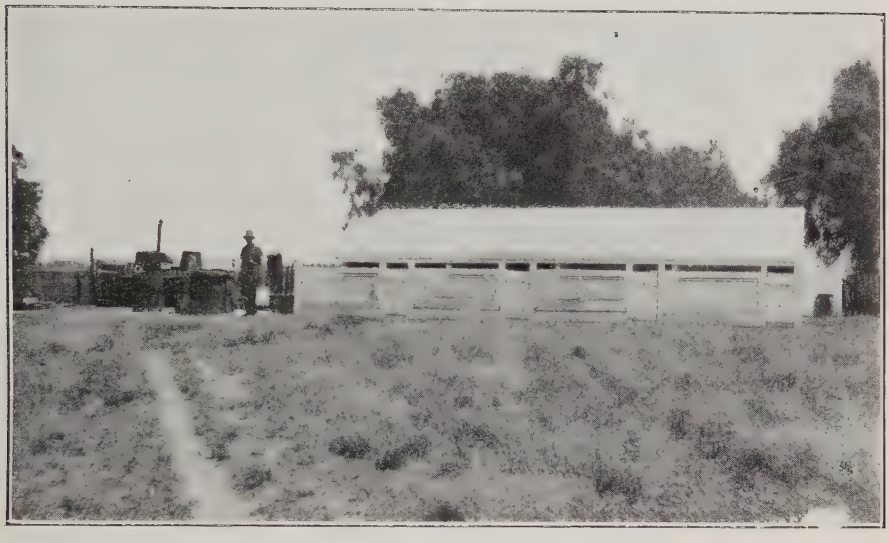


PLATE 42 (Fig. 39).
Piggery at the Dalby Sanatorium on Jimbour Plains.

PLATE 43 (Fig. 40).
Pig shed and paddock accommodation on farm of C. C. Low, North Arm, Queensland.

PLATE 44 (Fig 41).
Shed and paddock used by Walter Tully in his School Pig Club Work in the Mount Larcom District.

THE BACON PIG.

In an interesting article published in the "Journal of Agriculture," West Australia, Mr. G. K. Baron-Hay, Superintendent of Dairying, discusses in detail the position as it is in the pig industry in that State, where group settlements and other developmental schemes are in operation, and where considerable interest has been created in dairying and allied industries. That there is a very large opening in the West for enthusiastic pig farmers is clearly indicated in the statement that at present there is a local market for nearly a quarter of a million pounds worth of pork and bacon annually, the State's production last year being that much short of local requirements. There, as here, the number of pigs has fluctuated greatly from year to year, but has remained on the average constant, while the number of dairy cows has shown a continued interest. Mr. Baron-Hay indicates that this rapid fluctuation of the pig population is in itself an argument in favour of developing the pig industry, indicating as it does the capacity of the pig above all farm animals for rapid reproduction. The cow, it is stated, is only able to increase at a very slow rate in comparison, as is shown in the following table:—

	Annual Increase.
Cattle	80 to 90 per cent.
Sheep	95 to 115 „ „
Pigs	1,200 to 1,800 „ „

The article discussed the various problems responsible for fluctuation and for the apparent unpopularity of the pig industry, and deals in detail with fluctuation in prices of pig products, feeding stuffs, and the change of pig population from the wheat belt to the dairying districts of the State. The question of disease and its influence on the present and future position indicates that, in comparison, the pigs in the West are very healthy and that the risk of calamity should not check progress nor be other than a problem to face, for the percentage of pigs condemned for disease at the abattoirs is very light, the principal diseases being tuberculosis.

The Young Farmer.

FAT LAMB RAISING—A JUNIOR FARMER'S PROGRAMME.

Farmer Junior—the schoolboy of to-day and the wheatgrower, grazier, dairy farmer or fruitgrower of to-morrow—is an important factor in Australia's future, and it was a recognition of this that led to the institution of the Junior Farmers' Clubs of New South Wales, a movement that is also being fostered in Queensland. The club movement in the South commenced active operations about two years ago under the directions of a central council representative of interested departments and organisations, and with the good wishes of all concerned with the well-being of primary production.

That the movement is accomplishing valuable work there is no doubt. Some indication of its practical usefulness was afforded to those who attended the recent conference of the southern branches of the Agricultural Bureau at Albury, at which a special Junior Farmers' session was arranged. The chair was taken by Dudley Scholz, the president of the local club, and three papers were read by members. That the quality of these contributions was of a high standard the following extract, the concluding portion of Gordon Padman's paper on the subject of fat lamb raising, indicates. His plan to rear fat lambs would be:—

To use suitable rams—say Southdown or Suffolk.

To use the right type of ewe—big-bodied comeback or fine cross.

To have if possible flat country, hilly country, and cultivation.

To keep my ewes, before lambing, on the hilly country as much as possible, where they would not get too fat and would have to walk about a good deal.

To have good feed ready, by cultivation or otherwise, for the ewes when rearing their lambs, and to move them on to this good feed just before lambing so that they would have a good supply of milk for the young lambs.

To have all my paddocks of such a size as to enable the sheep to be moved from paddock to paddock frequently, thus keeping the grass short and fresh, and avoiding rank growth, which does not suit sheep.

To use my cultivation paddocks to grow green feed, and so make sure that my lambs would have plenty and would not be checked in growth.

To see that I got my lambs the right time of the year.

To make sure that my lambs would be offered for sale in a well-grown and prime condition, for I have noticed that good prime stock always brings good prices, while stock that is not good and prime sometimes has to be sold at prices that do not pay.

Finally, to see that the ewes and lambs were well supplied with a good salt lick.

Many much older farmers could not have outlined as sound a programme!

POINTS FOR PIG CLUB MEMBERS.

In an informative address recently on matters of interest to junior farmers and particularly to members of School Pig Clubs, Mr. E. J. Shelton, H.D.A., Senior Instructor in Pig Raising in the Department of Agriculture and Stock, Brisbane, stressed the fact that the Home Project scheme and all schemes of practical training for junior farmers aimed not only at creating additional interest and giving club members something special to think about, but aimed at emphasising the value of the open air system of stock raising nowadays so popular in every part of Australia. Stock should be kept out in the open as much as possible, he said, and we should strictly avoid keeping pigs in small, dark, and damp pens, or in enclosures where they had no opportunity for exercise or grazing on succulent pastures. Pigs were kept for profit making and for nothing else, and unless the system under which they were kept resulted in profit, the business was not worth while and should be left alone.

The pig had for generations borne the good name of being a rent-payer and a profit maker, and had been spoken of as "the hog that made Chicago," the "housewife's most wholesome sink," the "husbandman's best scavenger," and so on. The scheme aimed also at teaching lessons in co-operation, thus in combined clubs or in district clubs all that was best in the scheme and in the members was brought out. The club scheme had already been responsible for several very useful off-shoots, of which the Farm Boys' Camps at leading State Royal and Royal National Shows was a special feature. It was hoped in days to come that special schools of instruction would be held, at which club members would attend as representatives of their own schools and districts. To these outdoor schemes there must be added the advantage of indoor study and the development of an inquiring mind.

Every club member should have the ambition to be the best it is possible to be and to excel, no matter what the course of work undertaken.

We must be progressive in order to become proficient and efficient. The 4H Club motto of America was well worth bearing in mind. The four H's—

The Head to Plan.

The Hands to Carry out the work.

The Health to continue on with such progressive work, and

The Heart to stand up to both the success and disappointments associated with life on the land.

To be successful we must work hard, think hard, aim high, and hit high.

A scheme for the formation of senior clubs for boys and girls who had already left school should be quite possible, and could be organised in co-operation with the junior clubs already in operation. Pig club members are already eligible to attend the Schools of Instruction arranged at Agricultural Colleges, and recently a club member from the Gilston State School, Queensland, attended the School of Instruction to Pig Farmers held at Gatton College.

Items well worth consideration and productive of a good material for discussions at club meetings included the productive powers of farm stock, the profit there was in pig raising, the beneficial results of co-operation, the suitability of the district for agricultural operations, the value of hygiene, the extension of operations, lessons on feeding and care of animals, and so on.

There can be no doubt but that pig raising is a very profitable and lucrative undertaking, but it is well worth while discussing the disadvantages or drawbacks just as well as the advantages and profits.

There are many useful and informative pamphlets on agricultural subjects available for free distribution at the Agricultural Department in the several States, and school committees and club members should aim at securing and studying copies of these.

PARTS OF A COW.

Contributed by CHAS. F. MCGRATH, Supervisor of Dairying.

The following diagram illuustrates the various parts of a cow. It is necessary that you should make yourself thoroughly conversant with the names of the various parts before learning how to judge dairy cattle.

There are only two parts which require any explanation, viz., milk veins and the escutcheon.

Milk Veins.

The milk veins can be noticed and felt on and extending from the front of the udder along the underside of the body towards the forelegs. Of course these veins do not carry milk. The glands in the udder convert part of the blood into milk and so it follows that a large milk supply from a cow generally shows that it has a large blood supply, which in turn indicates that it must have large arteries and veins to carry that blood supply.

The milk veins carry the blood back to the heart and then to the lungs for purification. Where these veins enter the body will be found fairly large openings which are known as milk wells, which vary in size according to the size of the milk veins. Consequently, large tortuous and branching milk veins leading to large open milk wells are generally regarded as good points in a dairy cow.

Escutcheon.

This term, when applied to cattle, refers to the skin on the back portion of the cow extending upwards from the udder, on which the hair grows in an ascending instead of a descending direction.

The area and shape of the skin on which the hair grows in an ascending direction varies with different cows, and it was discovered by a Frenchman named Guenon that invariably different styles of escutcheons indicated the milk-producing capacity of the cow. Names have been given to these different styles, but as they are numerous it is not proposed to enumerate them here. Sometimes in the escutcheon small portions of the hair turn downwards. These are termed "feathers" although the term is used to cover any variation in the hair on or about the escutcheon. These feathers are of different shapes and are found in different positions on the escutcheon.

As a general rule the presence of "feathers" is not regarded as a good sign.

The escutcheon should be large and well defined.

1 Forehead
2 Horns
3 Eyes
4 Face
5 Muzzle
6 Ears
7 Neck
8 Chest
8a Brisket
9 Withers
10 Shoulders
11 Forelegs
12 Backbone
13 Barrel or Body
14 Heart Girth
15 Belly
16 Loin
17 Hips
18 Pelvic Arch
19 Rump
20 Pinbone
21 Tail
22 Thigh
23 Hind Legs
24 Fore Udder
25 Hind Udder
26 Teats
27 Milk Veins
28 Escutcheon

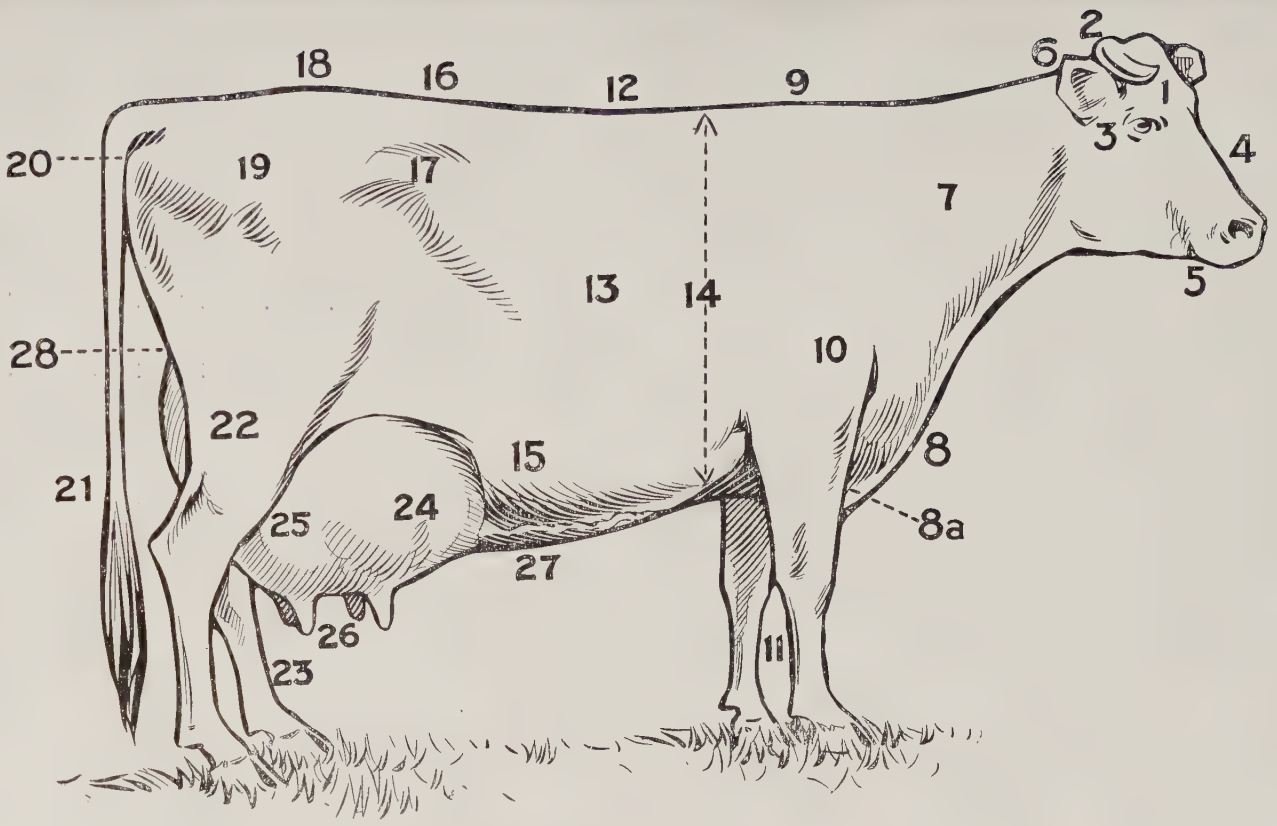


PLATE 45.—STANDARD MODEL DAIRY COW.

POINTS OF A TYPICAL DAIRY COW.

(Irrespective of Breed.)

FOR THE USE OF JUVENILE CLUBS.

Scale of Points.	Maximum Points.	Judge's Points.
General Appearance.		
Constitutional Vigour : As shown by heart room, apparent health, strength, activity and general appearance ..	5	
Form : Wedge-shaped, as viewed from front, side and top (additional to points given in detailed section) ..	3	
Quality : Hair fine and skin soft, medium thickness, loose, mellow, and unctuous with yellow secretion	6	19
Temperament : Active and nervous (but not "wild"), indicated by movement, eyes and lean appearance ..	2	
Colour	3	
Head, Neck, and Throat.		
Forehead : Broad and full		
Horns : Fine and of medium size		
Eyes : Large, bright, and yet placid		
Face : Lean, medium length, straight or slightly dished..		8
Muzzle : Clean and strong, mouth and nostrils large ..		
Ears : Medium size, fine in texture, yellow pigment inside		
Neck : Rather long and thin, fine, clean throat and dewlap		
Fore-quarters.		
Chest : Broad and deep		
Brisket : Lean and not fleshy		
Withers : Well defined, and not coarse at point of shoulders		5
Shoulders : Light, sloping, not too fleshy and oblique ..		
Legs : Straight, rather short, and not too large or coarse..		
Body.		
Backbone : Well-defined, lean, open-jointed and level ..	3	
Barrel or Body : Long and large, ribs broad, well arched, open, and set wide at finish ; a large strong body in proportion to size		21
Heart Girth : Large and deep, abundant room for active heart and lungs		18
Belly : Large, broad and deep, with a large and strong navel		
Loin : Broad and strong		
Hind-quarters.		
Hips : Wide apart, lean and refined		
Pelvic Arch : Prominent and strong		6
Rump : Long and wide, with pin bones wide apart and well defined		
Tail : Long, fine, with good switch and neatly set on ..	2	16
Thighs : Long and lean, flat inside and out, no beefiness, thin arched flanks		
Legs : Rather short, wide apart and not coarse ; placed squarely under the body		8
Udder.		
Fore Udder : Full, broad and extending well forward, not fleshy		
Hind Udder : Broad, full and attached high, not fleshy ; plenty of loose skin ; with a silky touch, without pronounced quartering		18
Teats : Of good size and form, evenly placed, and hanging perpendicularly, texture soft		31
Milk Veins : Upon the udder and in front of it, prominent, large and tortuous, leading to large open milk wells ..	5	
Escutcheon : Good of its kind	5	
	3	
Grand Total	100	

RECOGNISED COLOURS FOR HERD BOOK REGISTRATION.

I.M. Shorthorns.

Red (dark and light), red and white, roan, roan and white, strawberry roan, strawberry roan and white, and white.

Note.—Muzzle must be free from smuttiness, udder should not be quartered. Teats should be brown in colour.

Jersey.

Whole colour varying from fawn to almost black with orange markings on the back and middle piece, or broken colours.

Note.—Muzzle should be encircled by a light colour. Horns should be small and incurving. Yellow colour on horns, escutcheon and inside of ears indicating richness.

Clipped or shaved animals not recommended.

Ayrshire.

Red of any shade, brown or white, or a mixture of each colour being distinctly defined.

Note.—Long horns generally characterise the breed.

Friesian.

Black and white patches, each colour being distinctly defined. The following colours are not allowed and would bar registration in the Herd Book:—

(1) All black or all white or red and white.
(2) Black switch.
(3) Solid black with white on belly only.
(4) Black on legs, beginning at feet and extending to knees and hocks, or with white generally prevailing.
(5) Grey or mixed black and white, generally interspersed.
(6) Patches of colours other than black and white.

Guernsey.

Light yellow, brown, or fawn, with a flesh coloured muzzle, and with patches of white.

Note.—The horns turn upwards while the face is not "dished" like the Jersey.

HOW TO JUDGE DAIRY CATTLE.

In judging a dairy cow the first essential is to view the general outline of cow. This can be best done from a distance of ten or fifteen yards.

Side View.

The cow should be "close to the ground"—that is, its body should be fairly low and not "leggy."

The body should be wedge-shaped—that is, deep at the hind legs and narrower towards the fore legs.

Front and Back View.

When viewed from the front the wedge shape should be apparent. The well-sprung rib should contrast with the comparatively narrow forepart. A close inspection of the animal should now be made.

Udder.

If the cow is in full milk the udder, viewed from the back, should be wide and run well up towards the tail. Feel the udder. It should be elastic—soft and silky with an oily feel.

The udder, viewed from the side, should run well out under the belly and be held up close to the body for preference. Teats should be of medium length and not bottle shaped. They should be spaced evenly on the udder and should be of a dark colour for preference.

Milk Veins.

Run your hand along them. They should be large, and tortuous and extend well forward.

Skin.

The skin should be felt behind the last rib. It should be soft and elastic. A thick hard skin is a bad sign.

Escutcheon.

This should be of a comparatively large area.

Head.

The cow should have a good breadth between the horns, a well carved head, full, bright eyes, well developed nostrils, and a strong mouth with even jaws (not pig-jawed).

Neck.

The neck should be of good length, fine about the shoulder, and not baggy about the throat.

Back.

The back should be level from neck to tail, the backbone being well defined.

Tail.

The tail should drop perpendicularly and should be of good length, ending in a good brush. A short thick tail is a bad feature.

Hindquarters.

Should continue wide back to the pin bones. The thighs should be long and flat inside and outside, and from a side view should curve slightly forward.

PLATE 46.—A PIG CLUB CLASS AT CLOYNA.

The Instructor, Mr. Shelton, of the Department of Agriculture and Stock, is about to demonstrate on a porker prepared for the purpose. The nature and functions of the pig's "innards," their condition of health, and other pathological points will be explained to the young farmers while their elders, quite as keen, look on.

Plate 47.—Junior Fruit Packers Pleased with their Job.

In conjunction with the Department of Public Instruction the Department of Agriculture and Stock conducts fruit packing classes for school children. This picture was taken at Thornlands on the orchard of Mr. A. F. Smith, who supplied the fruit and other facilities for the success of the class. Each lesson lasts an hour, and these cases were packed by the young farmers in their second lesson. The children, under the leadership of their head teacher, Mr. Fraser, display great eagerness and keen intelligence in their club work.

PIG CONFERENCE IN THE WEST.

To invite discussion of the various problems and to get together to discuss the position, the West Australian Minister for Agriculture recently called a conference of parties interested, including representatives of the factory organisations, the distributors, the producers, and departmental officers. As a result, certain definite decisions were arrived at, and it was unanimously agreed that the type, conformation, and general quality of carcasses which meet the requirements of the bacon curers also meet those of the pork trade, and vice versâ. This discussion is of outstanding importance, as it is often assumed that different breeds or crosses are required to produce animals best suited to the pork and bacon markets respectively. A standard was set up for carcasses for pork or bacon in West Australia to which attention of all pig raisers is to be directed.

The type of carcass required in West Australia does not materially differ from that required in the Eastern States of Australia, but it is of interest to know that a definite breeding policy has been decided upon, and it has been unanimously agreed that for West Australia conditions a combination of the Berkshire and Tamworth breeds yielded the best bacon pig and also an excellent porker. The ideal pig would be obtained by the production of the breeding sow from mating purebred Berkshires with purebred Tamworths and mating the sows from the cross-breed to a purebred (unrelated) Berkshire boar. This is known as the "Berkshire-Tamworth comeback."

In grade herds of various breeds the purebred selected Berkshire boar is recommended for grading up and the production of bacon pigs. In order to produce standardisation within the pig industry, great importance is attached to the selection by the farmer of a suitable breed or cross, which principle is considered the foundation of the trade. The above recommendation has been based on purely commercial considerations; and concentration on two breeds or crosses, which supply the demands of the market, is undoubtedly preferable to diversity.

Answers to Correspondents.

BOTANY.

The following answers have been selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.:—

Broad-leaf Carpet Grass.

H.H. (Landsborough)—

Your specimen is *Paspalum platycaule*, the Broad-leaf Carpet Grass, a native of tropical America now widely spread over the tropical and sub-tropical parts of the world. It is very abundant in North Queensland, and of late years has come further south and is now quite common along several places on the North Coast Line between here and Gympie. It is not generally regarded as of a particularly high fodder value, but is useful for growing in poorer lands where ordinary paspalum will not thrive. A rather better strain from a fodder point of view is the narrow-leaf form sold in Australia under the name of *Axonopus compressus*.

Hare's Ear Mustard.

J. H. McC. (Dalby)—

The specimen is Hare's Ear Mustard, *Conringia orientalis*, a very common European and American weed now found naturalised throughout the more temperate parts of the world. It belongs to the Mustard or Cabbage family and the local name arose from the shape of the leaves being somewhat like that of a rabbit's ear. Beyond being a weed in cultivation it is not known to possess any harmful qualities.

Scrub Panicum.

A.J.G. (Duleen)—

The specimen is *Setaria macrostachya*, a native grass generally known as Scrub Panicum. It is not particularly common in any one locality, though it is fairly widely spread over Queensland, and is generally regarded as a rather coarse fodder. It is easily propagated from seeds, but it is not so succulent and has no particular advantage over other species of Setaria commonly cultivated under the name of Panicum, Hungarian Millet, &c.

Jack Bean *(Canavalia ensiformis)*.

N.D. (Beaudesert)—

The bean is a species of Canavalia, but these are rather hard to tell in the young stage. It is, however, we should say, *Canavalia ensiformis*, the Jack Bean, characterised by having large white seeds.

The bean may be used sliced as much in the same way as ordinary French beans in the young stage, or the nearly ripened seeds can be boiled and eaten in the same way as ordinary broad beans. It is as well to be cautious when using them as they do not agree with all stomachs, though we have used them at various times and found them quite good eating.

Another variety, *Canavalia gladiata*, is commonly grown here. It has large red seeds and is not generally considered so good as the white-seeded variety.

Buffel Grass.

M.A.V.B. (Alice Springs, Central Australia)—

The specimen is *Pennisetum cenchroides*, the Buffel Grass. We are very interested to learn that the grass is growing in Central Australia, as the only other place we knew of it growing in Australia in any quantity at all is in the north-western parts of Western Australia, where it was introduced from India about fifteen years ago. The manager of Dalgety's branch at Port Headland stated that it makes a tender sweet growth liked by all classes of stock, and in addition makes excellent hay, and in a good season grows from 18 to 24 inches high. Thinking the seeds might be injurious to wool we got in touch with Mr. MacKenzie, of Dalgety's, at

Port Headland branch, and he replied as follows:—"It is quite harmless to wool. It thrives here in purely cattle and sheep country, and does not affect the wool in any way."

The grass has, we understand, within the last couple of years been introduced into one or two places in Queensland, but we have not seen it growing here as yet.

Red Clover. Bougainvillea.

W.A.E.C. (Tamaree)—

Your specimen is Red Clover, *Trifolium pratense*. This is very interesting, as the Red Clover is not generally regarded as suitable for Queensland conditions, as it is inclined to die out with our hot summer weather.

Bougainvilleas.—There are several coloured variations, and the following are the best four now generally listed by nurserymen:—

Bougainvillea glabra var. *Sanderiana* or *Bougainvillea Sanderiana*, magenta coloured; *Bougainvillea lateritia*, the brick-red Bougainvillea; *Bougainvillea magnifica*, a bright purple of which a variety, var. *Araillii*, is listed as an improved form; and *Bougainvillea rosea* (also known as *Bougainvillea Thomasi*), deep pink. This last is generally regarded as one of the best, and plants are a little more expensive than the other varieties. The best time for planting is either spring or early summer.

Rattle Pod *(Crotalaria incana).*

J.C.H. (Jackson)—

The specimen, taken from an old cotton patch, is *Crotalaria incana*, a species of Rattle Pod. The genus Crotalaria is a large one, widely spread over the warmer parts of the world, the species being generally known as Rattle Pods or Rattle Boxes due to the rattling noise the seeds make in the dry pods. They are generally regarded as poisonous or harmful to stock and, mostly, stock avoid them. The plant you forward has come under suspicion at various times, though nothing definite has been proved against it. In view, however, of the poisonous nature of other members of the same group of plants it is as well to destroy it from paddocks where it makes its appearance.

Fuchsia Bush.

J. H. McC (Dalby)—

The specimen of fuchsia bush from the Dalby district represents *Eremophila maculata*. The specimen was also handed to the Agricultural Chemist, Mr. J. C. Brünnich, and the following is a copy of his analysis:—

		Lab. No. 2792 Fuchsia Bush.	Lab. No. 2996. Fuchsia Bush.
		Per cent.	Per cent.
Moisture		8·4	12·1
Analysis of Waterfree Material	Protein	18·0	12·4
	Carbohydrates	56·4	46·1
	Fat	0·7	1·1
	Fibre	14·4	32·4
	Ash	10·5	8·0
	Lime	1·491	·943
	Phosphoric Acid	·544	·216

The first sample had a very fair fodder value, but the second sample is very poor for a shrub and very indigestible on account of high fibre content. It is quite possible that this plant has a severe effect on worms, as it is highly poisonous, and according to latest researches a little less than 1 oz. of the air-dried leaves will kill a sheep in about forty minutes. It would be a great mistake to rely on this plant as a worm remedy, and it should be eradicated wherever found to avoid disastrous results, which might happen at any time.

PIG RAISING.

Replies selected from the outward mail of the Senior Instructor in Pig Raising, Mr. E. J. Shelton, H.D.A.:—

Cotton Seed a Risky Pig Food.

N.D.M. (Coominya)—

The Agricultural Chemist, Mr. J. C. Brünnich, states that the feeding of cotton seed to pigs is always risky, and that it is not a suitable food for breeding sows. As you have some separated milk and lucerne available, we would recommend maize grain and meat meal to complete the ration. With plenty of milk and lucerne you only require maize to balance the ration, but when skim milk is scarce the addition of meat meal will make up for the protein matter which is usually supplied in the milk. Lucerne should be used as fully as possible both as grazing and by adding lucerne chaff or dust to the skim milk. When milk is not available, the pigs will do well if grazed on lucerne and fed a ration made up of maize 80 lb., meat meal 10 lb., and lucerne dust or good leafy chaff 10 lb. If milk is used the meat meal can be reduced to about 3 lb. in every 100 lb.

Housing the Breeding Sow.

A beginner in the pig business recently asked a number of important questions having reference to his desire to gain up-to-date knowledge in regard to a number of details on which it was apparent there was a diversity of opinion. Among other queries the following were submitted:—

Question.—Would it be necessary to provide both sleeping and farrowing sties? I am told it is better to allow the sows to go away into the bush and farrow on their own and bring the young ones home when they are ready.

Answer.—The provision of suitable housing both for farrowing sows and for other pigs is strongly recommended. It is not argued that a sow that farrows in the bush will not produce a good litter; but on the average, the losses are about 50 per cent. higher than where the sows are properly cared for in sties. The pig sties need not be expensive buildings nor need they be elaborate, but sties are an absolute necessity just as are fences and feeding troughs. With regard to the number of sties that are required for fifty sows, at least twenty sties arranged for farrowing should be provided. Portable shelter sheds that can be moved from place to place in the paddocks where the pigs graze can be used for housing the paddock pigs. The central farrowing house is a necessity on a pig farm where there are sufficient sows to warrant the expense. This farrowing house would be a series of up to twenty or more pens adjacent to one another, and it is thought for preference, if the ground available permits, it is better to arrange these under one roof with a central passage-way and feeding troughs on either side, the pens to be approximately 10 feet wide by 8 feet deep, or at outside, 10 by 10, with feeding troughs in the same compartment as the sleeping floor if the style of building decided on permits of this. This would necessitate concrete or brick and cement floors both for the feeding area and the sleeping place, the latter to have a hardwood floor affixed on top of the concrete to obviate the necessity for the sow sleeping on the stone floor, the latter being objectionable and liable to lead to trouble from rheumatism.

It is admitted opinions vary on these questions, for some breeders prefer to have a long straight line of pens with the sleeping accommodation under cover at the back of the pens, and the front portion open (but securely fenced) to permit of the feeding trough being in the open exposed to sunlight, the feeding to be done either through a spout in the end of the trough which would project slightly beyond the sty, or by means of a swing-door opening into the trough. In both cases it is a decided advantage, even a necessity, to have good exercise yards attached to each sty so that the pigs can live out as much as is possible while compelled to remain in confinement with their young litters. In both systems a set of rails and a feeding trolley would be an advantage, and where the number of pigs to be fed warrants this it should be attended to. If this is not possible a feeding barrow of sufficient size to carry the feed required should be provided, or a less expensive arrangement—a barrel or two on a slide drawn by a horse, would suffice. The sow and litter should be transferred to the open runs again after the boar pigs are castrated (at six weeks of age) and the litter is approaching weaning age, but, if possible, no more than one or two sows and litters should feed together, as it is a mistake to have a number of sows and litters running in the one yard.

Under the American system the sows are kept in yards or small paddocks up to one-quarter of an acre or less in size, and each yard has an individual farrowing house which acts as sleeping quarters. The feeding troughs are then placed right away from the house, and the feed is carried by slide and barrel or by some other system of a labour-saving nature.

It is, generally speaking, a mistake to allow sows to go away into the bush and farrow without any attention at all, though even under this system some breeders report successful results. The housing of the breeding sow is a subject worth the closest study.

Costs in Pig Raising.

Question.—When growing pig feed, does one deduct from the price of the pigs sold, the market value of the food produced, or only the actual cost of producing the food; that is, if it costs me 2s. 6d. to produce one bushel of corn, and corn was worth 4s. 6d. per bushel, would I deduct 4s. 6d. from the price of my sale pigs or only 2s. 6d.?

Answer.—To ascertain the actual profit resulting from the sale of any line of pigs, one must not only deduct the cost of food, but also of labour, cartage, and incidental charges generally. It is usual to deduct the actual value of the food produced only. Of course, by actual value in this case is meant the value of the crop, as it is in the form in which it is fed to the pigs. Take corn, for instance. Corn-growing or ripening in the paddock cannot possibly be valued at the same price as that which is sold in the market; it costs something in the first instance to plough the ground, harrow, drill, sow, cultivate, and produce the crop to the stage at which it is ready for pulling. Then it costs somehing more to pull the corn, husk and shell it, clean, bag, and place it on the market; the latter charge will be proportionately higher than the former; hence, in charging up the value of the corn as a pig food you would value it at its actual cost to you on the farm. It is difficult to say how much a bushel of corn costs to produce, but it certainly is not worth 4s. 6d. per bushel (or its market value) until it is in the bags and on the market. It would not be fair to charge up the cost of the corn to the pigs at the market price you receive for it after you have gone to the expense of husking, shelling, cleaning, bagging, carting, railing, or shipping, and selling it at auction in the market. The pigs can do the husking, shelling, &c. The same may be said of any other crop; you would charge up its actual value on the farm, not its value on the city or other markets.

The whole question of costs of production is an important one, and one that needs very close attention if the farmer is to work on anything like up-to-date lines. The old rule-of-thumb methods do not pass nowadays, for we must keep some records or we cannot correctly make the allowable deductions in making up our income tax papers, or in giving details of cost of production. It is a good idea to keep a record of the market value of any foods used and to endeavour to figure out the additional profit resultant from utilisation on the farm of the crop or foods produced thereon. The farmer is not however usually inclined in the direction of accountancy, but it adds considerable interest to the business if we know exactly or approximately how we stand financially.

Arsenic Pentoxide as a Spray. Grenadilla. Banana Suckers.

V.T. (Djarowong, Feluga, N.Q.)—

1. *Spraying of Grass with Arsenic Pentoxide.*—The Director of Agriculture advises that a test of this character has not been carried out. However, as this chemical is a very potent plant poison it may have an effect on partly matured seed. The better plan would be to burn off the dried grass after it has been sprayed. Another substance suitable for weed and grass destruction is Sodium Chlorate. Information on and supplies of the poison may be had on application to A. C. F. and Shirleys Fertilisers Ltd., Little Roma street, Brisbane.

2. The Agricultural Chemist, Mr. J. C. Brünnich, advises that nothing is known about the vitamine content of the grenadilla. Like all fruits, it is bound to contain some.

3. The Director of Fruit Culture, Mr. Geo. Williams, advises that a banana sucker cut close back should have the centre "scored" out and a shoot allowed to develop from the side. It will then throw a better bunch than if not cut back at all.

General Notes.

Staff Changes and Appointments.

Messrs. F. C. Robinson and R. A. Ulcoq, of Gayndah, have been appointed Honorary Inspectors under and for the purposes of "*The Diseases in Plants Act of* 1929."

The Officer in Charge of Police at Cardwell has been appointed an Acting Inspector of Stock and also an Inspector of Brands.

Mr. C. Mitchell, Health Inspector, Townsville, and Mr. W. Austin, Health Inspector, Mackay, have been appointed Inspectors under and for the purposes of "*The Dairy Produce Act of* 1920."

Mr. W. Cottrell-Dormer has been appointed Assistant Pathologist, Bureau of Sugar Experiment Stations, Department of Agriculture and Stock, as from 1st April, 1930.

The services of Mr. P. J. Short, Temporary Inspector of Slaughter-houses, Warwick, have been continued from 1st May to 30th June, 1930; and the services of Mr. F. C. Shaw, Temporary Inspector of Slaughter-houses, Cairns, have been continued from 18th May to 14th June, 1930.

The appointment of Acting Sergeant D. J. Gavin as Acting Inspector of Stock has been cancelled, and, in lieu, the Officer in Charge of Police at Bell has been appointed an Acting Inspector of Stock. Mr. E. C. Dunn, Inspector of Stock, Kingaroy, has been appointed also an Inspector of Brands; and the services of Mr. F. C. Shaw, Temporary Inspector of Slaughter-houses, Cairns, have been continued from 15th to 30th June, 1930.

The following have been appointed cane testers for the forthcoming sugar season at the mills mentioned in each case:—Miss D. Marles (Babinda), Mr. T. P. Brown (Bingera), J. G. D. Casey (Cattle Creek), T. D. Cullen (Fairymead), Miss F. Parkinson (Farleigh), Miss E. Christsen (Gin Gin), G. R. Jorgensen (Inkerman), Miss M. T. Smith (Invicta), Miss J. O'Flynn (Isis), W. Ahern (Kalamia), W. Richardson (Marian), Miss A. L. Levy (Maryborough), C. J. Boast (Millaquin), Miss I. Palmer (Moreton), V. F. Worthington (Mossman), F. H. Compton (Mount Bauple), Miss N. Walsh (Mourilyan), H. Jensen (Mulgrave), Miss J. Orr (North Eton), T. Breen (Pioneer), L. G. F. Helbach (Plane Creek), W. J. Mason (Pleystowe), L. Chadwick (Proserpine), Mrs. K. Dunton (Qunaba), L. G. Home (Racecourse), J. Howard (Rocky Point), T. Herbert (South Johnstone), and F. Jorss (Tully).

The following have been appointed assistant cane testers for the forthcoming sugar season at the mills mentioned:—Miss A. Mullin (Babinda), Miss M. A. Morris (Bingera), G. Tait (Farleigh), Miss G. Dingle (Inkerman), Miss C. Humphreys (Invicta), G. Fanning (Kalamia), D. Walton (Marian), Miss N. C. Whittle (Marian), Miss A. Murray (Maryborough), Miss D. Bowder (Millaquin), Miss M. A. Lyle (Moreton), Miss T. Payne (North Eton), H. Whitcher (Pioneer), Miss M. Orr (Plane Creek), Miss E. Rowe (Plane Creek), H. Humphreys (Pleystowe), Miss O. Knight (Pleystowe), Mrs. M. Nally (Proserpine), and T. F. Corbett (Tully).

The transfers of the following District Inspectors of Stock have been approved:—W. N. Holmes, from Warwick to Townsville; J. J. Ashe, from Townsville to Mareeba; and E. C. Lake, from Mareeba to Warwick. Mr. J. Gunne, Inspector of Stock, Boonah, has been transferred to Gladstone, and Mr. J. P. Dowling, Inspector of Stock, Warwick, has been transferred to Clermont. Mr. J. C. Pryde has been appointed a Temporary Inspector of Stock and Slaughter-houses at Gympie. Mr. W. O. Hynes, of Godfrey street, Toowoomba, has been appointed an officer under the Animals and Birds Acts.

The Officers in Charge of Police at the following places have been appointed Inspectors of Brands:—Biggenden, Eidsvold, Gayndah, Gin Gin, Goomeri, Howard, Imbil, Kilkivan, Kumbia, Monto, Mount Perry, Mundubbera, Murgon, Proston, Rosedale, and Tiaro.

Commodity Boards—Government Representation.

The constitutions of the Arrowroot, Cotton, Atherton Maize, Barley, Honey, Canary Seed, and Butter Boards have, till the present time, provided that those boards shall consist of a certain number of elected representatives of the growers of the particular commodity and the Director of Marketing. The constitutions of these boards have now been amended to allow of a deputy appointed by the Minister representing the Minister on the boards in case of the absence of the Director of Marketing.

Inkerman Mill—Levy Transfer.

As the result of a levy made on the Inkerman mill suppliers during 1929, in order to defray expenses in connection with the farmers loading sugar at Townsville during the Waterside Workers' strike in 1928, a balance of about £80 was left after the payment of expenses. An amendment has been approved to Regulation 210 (which gave the mill suppliers' committee power to impose the levy) whereby this balance may be transferred to the administrative fund of the committee, thus making the levies for this year for administrative purposes so much lighter.

Cheese Board.

An Order in Council has been approved giving notice of the intention of the Governor in Council to issue an Order in Council extending the operations of the Cheese Board for a period of three years as from 1st August, 1930. It is also declared that the Governor in Council will receive, on or before the thirtieth day of June, 1930, a petition signed by not less than 10 per cent. of the growers of cheese requesting that a vote of such growers be taken on the question as to whether the functions of the Cheese Board shall cease on 31st July, 1930, or continue until 31st July, 1933. Growers eligible to vote will be persons who, at any time within the six months immediately prior to the election, supplied or supply milk to cheese manufacturers in Queensland.

Entomological Branch—Mr. Veitch's Tour Abroad.

The Secretary for Agriculture (Mr. H. F. Walker) announced recently that Mr. R. Veitch, the Chief Entomologist and Vegetable Pathologist for his Department, had left by the R.M.S. "Maloja" for England.

Although Mr. Veitch is really going on a holiday tour, Mr. Walker has commissioned him to visit the chief entomological and vegetable pathological institutions in Great Britain with the object of acquiring any information that would be useful to his Department. At the same time, he would make inquiries into the possibilities of securing a suitable Pathologist who would be able to undertake the work in Queensland in connection with the disease of pineapples. This matter had recently been brought under Mr. Walker's notice by the Pineapple Sectional Group Committee.

Mr. Veitch would also inquire into the practicability of obtaining in Great Britain the services of an Entomologist who would devote his time to the entomological problems, particularly the corn ear worm, connected with cotton-growing in Queensland.

Cattle of the Future—Significant Facts.

From the Red Poll Cattle Society:—Significant facts with regard to the future of the cattle-breeding industry in most parts of the world are to be seen in the growing attention that is being bestowed in the breeding of dual-purpose stock. Evidently the warning note sounded by those in a position to judge of the future, that a beef shortage is imminent, has had not a little to do with the remarkable demand that has sprung up not only in Great Britain for dual-purpose cattle but of the widespread trade experienced for the dual-purpose Red Poll bull overseas. This British breed, which enjoys a considerable reputation for hardiness, has, in the last two years, met with its biggest export demand in its long history.

The remarkable trade for sires grows apace. While they have gone to North and South America, and have also been imported into Australia in the last twelve months, the extraordinary demand with South Africa, East Africa, and South-west Africa continues unabated. It is explainable when, according to the statement of a big ranch owner in one of the driest parts of South Africa, the Red Poll has proved a type of cattle desirable for semi-tropical countries because of its strong constitution and ability to produce butter and beef. The same farmer states that experience has shown him that the Red Poll has best served his purposes for cross breeding, and he emphasises the value of a dual-purpose breed owing to what, as he says, has proved the unwise policy of having bred for the pail, thereby leading to the production of far too many long-legged animals of poor constitution.

So far this year the exports of Red Polls have been to Kenya Colony whither a fresh contingent are on the way, Southern Rhodesia, Victoria (Australia), the Argentine, Queensland (Australia), and Brazil. The continuance of this trade for Red Polls for both pure and cross breeding, while being not a little due to the dual-purpose characteristics, is the outcome of a decided tendency for cattle breeders to have two strings to their bow, by producing milk and beef from one and the same breed.

Cotton Board.

An Order in Council has been passed amending the Primary Producers' Organisation and Marketing Acts so that now the Cotton Board shall not take cognisance of nor be compellable to pay any order given by a cotton grower to pay to any person, except the Crown or itself, any portion of the moneys due to such grower on account of seed cotton by the Board. This means that, in future, the Cotton Board need not recognise any orders given by cotton growers to tradespeople or others on account of any moneys due to them by the Cotton Board for seed cotton.

The Fruit and Vegetables Act.

The grade standards in use at present for Cavendish bananas ("Special," "Choice," "Standard," and "Plain") have been rescinded, and a regulation has been passed under the above Act substituting new standards therefor. These new standards are "Sixes," "Sevens," "Eights," and "Nines," and the measurements are as follows:—

Sixes—5½ to 6½ in. in length, by 4 in. in circumference;
Sevens—6½ to 7½ in. in length, by 4 in. in circumference;
Eights—7½ to 8½ in. in length, by 4¼ in. in circumference;
Nines—8½ in. and over in length, by 4¾ in. in circumference.

All measurements for length are to be taken on the outside of the curve from the junction of the fruit at the stem end to the apex of the fruit.

Returns by Honey Merchants.

Regulations 246 and 247 under the Primary Producers' Organisation and Marketing Acts have been approved. These regulations provide that, for the purpose of collecting statistics for the use of the Honey Board, all wholesale merchants for the sale of honey must furnish to the Minister, on or before the 14th June, 1930, returns in respect of the twelve months from the 1st May, 1929, to the 30th April, 1930, as follows:—

(1) The total quantity of honey (in lb.) purchased during the period, showing the quantity purchased direct from growers, quantity purchased from commission agents, and any purchases from other States, naming the States.
(2) Stock of honey on hand at 30th April, 1930, and the proportions of which are Queensland honey and Interstate honey.
(3) Stock of honey on hand at 30th April, 1929.
(4) Wholesaler to state whether he has a blending and bottling plant in use on his premises, and, if so, what type and capacity.
(5) Signature and address.

Any person who commits a breach of the above regulation shall be guilty of an offence, and be liable to a penalty not exceeding five pounds.

Farm Life—Influence of the Motor.

It is doubtful if there is any other class of the community whose life has been so much affected by the motor vehicle as the man on the land. The farmer to-day is in touch with all the advantages of urban life, without certain of the drawbacks that living in a city undoubtedly has. The cultural advantages that are made possible by massed population are open to the farmer and his family by means of motor transportation on just as easy terms as they are available for residents of the city. The isolation, which used to be a burdensome characteristic of farm life, has been removed by the introduction of the motor vehicle, but even this contribution to the pleasure of rural life is not the most important factor in the benefit given to the farmer by motor transportation.

On the practical, utilitarian side the contribution is even greater. By means of motor transport vehicles the hauling time for farm products has been cut probably to a quarter of what it used to be. This means that the farmer's labour bill to-day can be devoted principally to productive effort on the land, instead of being to a considerable part a payment for the necessary but unproductive work of carting. Where years ago a man's whole day, and perhaps many days together, was needed for carting produce to market or railway a quarter of that time now suffices and the rest is available for more productive work.

This item of hauling carries with it, of course, the benefits that have accrued to the farmer from the multiplication of good roads, which never would have come without the impetus given by the motor car.

Banana Growing in the Quarantine Area.

The Secretary for Agriculture and Stock, Mr. Harry F. Walker, announced recently that as promised at the meeting of banana growers held at Palmwoods on 12th June, he had conferred with the members of the Banana Protection Board (Messrs. K. R. Hack and A. E. Maher, representing the growers, and G. Williams, Director of Fruit Culture, and J. H. Simmonds, Plant Pathologist, Government Representatives), also Mr. W. Ranger, Manager of the Committee of Direction of Fruit Marketing, regarding the question of allowing planting in the recently proclaimed Bunchy Top Quarantine Area, and as a result of this conference it had been decided unanimously that permits in the quarantine area shall be issued subject strictly to the following restrictions, in addition to the general conditions laid down by the Board:—

1. No permit shall be granted to an applicant whose plantation at the date of application, either wholly or in part, is in a neglected condition or has at any time during the preceding six (6) months been known to be so and/or where such neglected condition has not been rectified without without pressure from an inspector.
2. No permit shall be issued in respect of any plantation in which Bunchy Top has appeared during the preceding four (4) months. Exemptions from this clause may be granted by the Board under special circumstances.
3. In general, permits shall not be issued for any area or areas which will bring the total acreage under bananas for any one owner or occupier in excess of eight (8) acres, unless by special permission of the Board.
4. Planting of new areas by persons not at present established in the district is undesirable, and permits for such planting will only be granted by the Board under very special circumstances.
5. Any plantation in which Bunchy Top is found discernible in the third leaf from the top of the plant shall be classed as a neglected plantation and dealt with as such.

Declaration of Banana Plants as a Pest in Metropolitan Fruit District.

A Proclamation has been issued proclaiming a Metropolitan Fruit District (No. 10 under the Diseases in Plants Act), and a second Proclamation has also been issued proclaiming that all plants of the Genus Nusa (including Bananas, Plantains, and Manila Hemp), but not including the fruit thereof, in such Metropolitan Fruit District, are pests under and for the purposes of "*The Diseases in Plants Act of* 1929."

The boundaries of the Metropolitan Fruit District are defined as follows:—Commencing on the right bank of the Brisbane River at a point south from the south termination of Bunya street, Whinstanes, and bounded thence by a line and that street north to the Pinkenba Branch Railway, by that railway south-westerly to Mordant street, by that street north, by Hampden street west, by Nudgee road northerly to Blinsinger road, by that road north-westerly to Northgate road, by that road north-easterly to Tufnell road, by that road north-westerly to Downfall Creek, by that creek upwards to the Sandgate road, by that road north-westerly to Robinson road, by that road west to Railway parade, by that parade south-easterly to Geebung road, by that road south to Hamilton road, by that road west to Gympie road, by that road southerly to Stafford road, by that road westerly to South Pine road, by that road, Bell street, and Stewart road southerly to Waterworks road, by that road westerly to Orchard road, by that road, Barnett road, Simpson's road, Mount Coot-tha road, Dean street, Sherwood road, and Miskin street southerly to Stanley terrace, by that terrace westerly to Taringa parade, by that parade, Moggill road, Witton road, and Bridge street southerly and east to the Brisbane River, by the right bank of that river upwards to a point north from the northern termination of Fort road, by a line, that road, and a road in continuation south-easterly to Ipswich road, by that road and Rice street north-easterly and northerly to Hamilton road, by that road and Beaudesert, Mayfield, Toohey, Marshall, and Holland roads easterly and north-easterly to Cavendish road, by that road and Boundary road northerly to the Old Cleveland road, by that road easterly to Creek road, by that road, Murarrie, Queensport, and Lytton roads northerly to Bulimba Creek, by that creek downwards to the Brisbane River; and thence by the right bank thereof upwards to the point of commencement.

As a result of the foregoing it will now be necessary for all persons having bananas growing in the abovementioned area to take them out and destroy them. The object of the declaration is in connection with the campaign to prevent the spread of Bunchy Top in banana-growing areas. At the present time the growing of bananas in suburban gardens is a serious menace to the industry, and in the vast majority of cases these bananas serve no useful purpose.

Clothes of Australian Make.

Mention was made at the annual meeting of shareholders in Pike Brothers, Limited, Queen street, recently, of the great advance that has taken place in the making of Australian goods. Due to the company's effort to get manufacturers to make for them special quality goods, with exclusive features, it is now found necessary to import but a small percentage of stock, and that only in the really exclusive wares from world-renowned producers whose goods would ever be sought. It is estimated that about 87½ per cent. of the firm's stock is made in Australia, practically all ready-to-wear clothing; all shirts and pyjamas are made on the premises. Almost all their collars are now made in Australia, while the greater proportion of the hats, caps, underwear, boots, and leather goods are all purchased here, from those makers who were prepared to meet Pike's special demand for super-quality articles.

The Tell-tale Strainer.

Examination of milk samples for bacterial content proved conclusively that the cleansing of the cow's udder and the grooming of her body were absolute necessities. It would be a very progressive step if all and sundry regarded the milk strainer as a superfluous dairy appliance. After all, a strainer only arrests what really should not get in. Foreign matter that might find its way into the milk or portion of it might become soluble and pass through the strainer, constituting thereby a perfect nucleus for a rich bacterial content in very quick time. The gauze of the strainer is the dairy hand's tell-tale, and it is not edifying to see it bumped about before the milking has made much progress so that the flow of milk through its meshes might be imperfectly strained.

Care of Harness.

Harness perishes very quickly if neglected, but if reasonable care is exercised it will last for years. Plated harness should not be kept in the stables, as the gases arising from the decomposition of the excreta tarnish the fittings. Immediately the harness is brought in the dust should be carefully wiped off with a soft cloth or leather, and mud or sweat removed by washing with water, but on no account should too much be used. The bits should be well washed in clean water, thoroughly dried, and rubbed over with a little neatsfoot oil. The leather should be kept soft and pliable by using some dressing. Any one of the proved commercial compositions is suitable and cheap.

Heavy harness does not require the same attention, but it must be kept pliable and tough by oiling at regular intervals. Leather which is not treated soon becomes hard under our dry conditions, and cracks, while the stitching decays. A very suitable dressing is pure neatsfoot oil. Some very effective and cheap mixtures are on the market for dressing heavy harness.

Atherton Tableland Maize Board—Traffic in Maize.

An Order in Council under the Primary Producers' Organisation and Marketing Acts has been issued to deal with the traffic in maize on the Atherton Tableland. The Acts now provide that all maize grown on the Atherton Tableland must be delivered by the growers to the Board or its agents by the nearest road or railway, under conditions fixed by the Board by notice published in any newspaper circulating in the district. Except for delivery to the Board or its agents, a grower must not remove any of the commodity from his premises without the prior consent of the Board; any person doing so will be liable to a penalty of not more than £500.

No person shall remove any maize except with a permit from the Board authorising him to do so. This permit will give the conditions and the period of duration for such removal, as determined by the Board. The Board may refuse to grant a permit without giving reasons. The permit must always be carried, and must be produced for inspection by any member or inspector of the Board or member of the Police Force. The Board may appoint any persons to be inspectors.

Any member or inspector of the Board, or police officer, may, at any place within a radius of fifty (50) miles from the boundary of the area concerned, examine any vehicle suspected of carrying any of the commodity, may order the driver to stop for sufficient time to allow any goods carried to be inspected, and may seize any of the commodity found. Any person disobeying such orders shall be liable to a penalty not exceeding five hundred pounds (£500).

In any prosecution the averment that maize concerned is part of the commodity will be deemed to be proved in the absence of proof to the contrary. The Commissioner of Railways or any shipowner may, on the request of the Board, without incurring liability, refuse to carry any of the commodity, except Interstate consignments.

The Pastern.

In judging of the points of a horse the conformation of the pastern is generally recognised by horsemen to be among the features to which leading importance attaches, this being on account of the intimate bearing which it has both upon the question of the wearing capacity of the legs and character of the action, while in the case of hunters the conformation of this joint, moreover, is of some influence as regards the question of their galloping and jumping.

The essentials sought for in good pasterns, briefly summed up, are that they should be well sloped and of adequate length. Both the length and the degree of slope, of course, vary considerably according to the breed, and these terms are therefore to be taken in a comparative sense. In thoroughbreds, for instance, the pasterns are always longer than they are in less well-bred horses, while they are relatively short in cart horses, as compared with well-bred horses of the light class. Similarly, in regard to the question of slope, one looks for more obliquely placed pasterns in the latter type of horse than in heavy horses used for slow draught work.

33 Gallons Daily from Five Cows.

Near Land's End there is a pedigree Guernsey herd owned, milked, and managed by Mr. E. Gerrish, of Carrallack House, St. Just, Cornwall. This herd, rationed under the Boutflour system, was the first to complete a 1,000-gallon average in the Cornwall Milk Recording Society, and for three successive years, against all breeds, has won the inter-herd challenge cup competition organised by this society.

News has just reached us that one of the cows in the herd, "Chorleywood Programme 3rd," is still adding to her previous wonderful records, and is now milking heavily with her ninth calf. She was born in April, 1920, was unfortunately not recorded during her first lactation, but has since yielded in consecutive lactations 604, 900, 1,123, 1,250, 1,084, 1,642, and 1,290 gallons. She is showing every promise of producing another heavy yield with her ninth calf. All of her calves (seven heifers and two bulls) are living. To give some idea of how Mr. Gerrish has developed the heavy milking capabilities of his Guernseys it might be mentioned that from five cows at one time he maintained an output of about 30 gallons daily for a considerable period, and on one day produced no less than 33 gallons from these five Guernsey cows.—"Live Stock Journal" (England).

Peanut Board.

The Governor in Council has approved of a Notice of Intention to create a reconstituted Peanut Board for a period of ten years. This Peanut Board will apply to all peanuts produced in Queensland. The Board to administer it will consist of four (4) elected representatives of the growers and the Director of Marketing.

All the commodity will be diverted from the growers and become the property of the Board as owners. The peanuts must be delivered to the Board in an unshelled condition, and a grower shall not remove any of the peanuts produced by him from his premises, except for delivery to the Board or its agents, unless the prior consent of the Board has been obtained.

Persons entitled to vote at a referendum or an election shall be those who have produced peanuts for sale in Queensland at any time during a period of twelve (12) months immediately prior to the poll. If a reconstituted Peanut Board is created, the present Peanut Board will go out of existence, and the new Board will take over all assets and liabilities of the old Board.

The existing Peanut Board Levy Regulations dealing with levies to provide for storage facilities, &c., shall continue to be operative during the currency of the new Pool.

Any petition for a poll to decide whether or not the new Pool shall be created must reach the Minister for Agriculture and Stock, Brisbane, before the 30th June, 1930, and must be signed by at least fifty (50) peanut growers.

Nominations for the growers' representatives on the new Board must reach the Under Secretary, Department of Agriculture and Stock, Brisbane, before 5 p.m. on 30th June, 1930. These nominations must be signed by at least seven (7) persons who have grown peanuts for sale during the preceding twelve months.

At the same time nominations are invited until 5 p.m. on the 30th June, 1930, for the election of four (4) growers' representatives on the existing Peanut Pool. Each nomination is to be signed by at least seven (7) persons who have had growing peanuts on areas of not less than one-half (½) an acre at any time during the last twelve months. These latter additional nominations are necessary pending the creation or otherwise of the new Pool. Full particulars will be found in the *Government Gazette* of the 31st May, 1930.

Cheap Experience.

To a shrewd, practical man there is nothing more instructive than a walk over somebody else's farm, for he will be able to note how the land is farmed and the various methods applied. Such a man may learn much by just watching what others are doing in another part of the country. Then, again, by noting how cattle are fed and what rations are being given, the keen man can pick up many a wrinkle worth remembering when he gets home again. Tours are good for the average farmer; they help to give him new ideas and to broaden his outlook, and so inspire him to better farming practice. While it is well to use the same farm for years and years, yet at the same time a man can stay too long in his own locality absorbed in his own methods, and thus may be ignorant of some of the improved methods that are being used outside his own narrow little circle.

Sheep and Wheat—A Valuable Combination.

Sheep are indispensable on the wheat farm. In the control of weeds, in improving the fertility of the land, and in many other ways their indirect value is often of greater importance than the cash return from wool, mutton, &c.

Briefly, the points in favour of combining sheep with wheat are as follows:—

(1) They consume the straw left after the harvest.

(2) They turn weeds to profit, and prevent them from seeding at times when the farmer is unable to deal with them owing to pressure of other work.

(3) Their manure improves the fertility of the land.

(4) When the season is so bad that the crops fail to produce grain, sheep turn them to profitable account.

(5) The income from the farm is rendered more certain, as the farmer is not entirely dependent upon a crop which may be destroyed by fire or hail.

(6) Sheep necessitate the adoption of a rotation, which tends to improve the fertility of the land, check crop diseases, and increase the yield of crops.

(7) They can be used to feed off crops that need such a check.

(8) A supply of cheap mutton is made available for the farmer's own household.

(9) To the above may be added the pride and pleasure derived by the farmer from the possession of a good flock.

—A. and P. Notes, N.S.W. Dept. of Agric.

The World's Grain Exhibition in 1932.

A world's grain exhibition and conference of wheatgrowers will be held at Regina, Canada, from 25th July to 6th August, 1932. Few realise the magnitude of the undertaking and the far-reaching influence it will exercise upon the basic industry of agriculture, particularly upon the quality and quantity of grain production the world over. As Regina is the heart of the largest area in Canada producing wheat and other grain, it was considered the logical point for the exhibition which is being supported by the Federal and Provincial Governments. Entries and exhibits will be received up to 1st March, 1932, to give ample time for judging and the arrangement of each exhibit. The benefits to the agricultural industry the world over to be derived from friendly competition in the "show-ring" of the best grain produced in every land is at once apparent. The prize list provides every indication that its compilation has been made as attractive as possible so that the number and representative nature of the exhibits would reach the maximum. Over $200,000 (£41,667) is being offered in cash prizes for wheat, barley, maize, rye, buckwheat, rice, millet, field peas, soybeans, sunflower, field root seed, and collections of garden vegetable seed, in all comprising nineteen sections subdivided into 55 classes, with 1,600 prizes varying from $2,500 (£500) to $10 (£2). The entrance fees are very modest, particulars of which can be obtained from the Canadian Trade Commissioner, Melbourne.

The conference in connection with the exhibition will be of immeasurable importance, and every effort is being made towards ensuring it being representative of the world's best thought along practical and scientific lines. Experts from many countries, men who are recognised leaders in their own particular fields of activity, are being solicited to take part. In this way, it is hoped to make the conference the "clearing-house" for world thought and knowledge on every branch of field crop production and marketing.

Another Credit Entry in the Cow's Account.

The casein of milk in powder form is used for plywood paint and printers' ink, dressing table requisites, and imitation leather, and now Mr. E. J. Forster, a research chemist of Manly (New South Wales), claims that by combining casein and sawdust or shavings, he can make a board suitable for building material. The board is said to be of extraordinary strength, durability, cheapness, non-absorbent, and non-inflammable, and is to be marketed at 35s. a hundred square feet, compared with 52s. for building pine.—"*The Farmer and Settler.*"

A "Shell" Story for Small People.

A charming little publication for children has been produced by the Shell Company of Australia, Limited, for free distribution on application throughout the Commonwealth. The illustrations have been well done by the young Australian artist, Miss Sheila Hawkins, and much attention has been paid to detail. The half-dozen plates have been produced in four colours, and there is a generous sprinkling of black and white drawings. The simple story is that which has appealed to the child mind since time immemorial—of fairies and goblins, and the small girl who is waylaid and ushered into the inner sanctums of fairly life. With its Australian setting it promises to have a wide appeal wherever young people are gathered together—at school, at home, and at play. The booklet is well prepared on tinted art paper, and is generally significant as indicating the upward trend of commercial publications in this country. It is an all-Australian production.

A copy is obtainable on application to the Shell Company, Department Advertising.

Acquisition of Strawberries by Committee of Direction.

Regulation 188 made under the Fruit Marketing Organisation Acts on the 15th May, 1930, provided for the conducting of a ballot of all strawberry growers on the question as to whether an Order in Council be issued declaring that strawberries grown in Queensland for a period of twelve months from the 15th May, 1930, for sale to fruit canners or as fresh fruit on a wholesale basis shall be acquired by the C.O.D. as the owners thereof. A ballot was accordingly conducted by the C.O.D., with the result that, of 613 ballot-papers issued, 354 were returned; of these, 273 were in favour of the acquisition, 72 were against, and 9 were informal. Thus 79.1 per cent. were in favour, and, as this is in excess of the required 60 per cent., the Order in Council has now been issued.

The Order provides that all strawberries grown in Queensland and coming into the possession of any person for the purpose of selling or offering them for sale to any fruit canner or preserver, &c., or for fresh fruit on a wholesale basis, during the period from 10th June, 1930, to 14th May, 1931, shall be acquired by the C.O.D. as owners thereof. The C.O.D. has the power to do all necessary things for the purpose of effectively carrying out the marketing of such strawberries as owners thereof on behalf of the growers. The Order shall have no effect so as to prejudice any interstate contracts which had been entered into prior to such acquisition. The Order shall remain in force from the 19th June, 1930, until the 14th May, 1931.

Reduced Production Costs Mean More Profit.

The urgent need in Australia is to lower the cost of production of the commodities of which we produce a surplus—wool, wheat, butter, and fruit. With falling values for these staple commodities it is essential, if we are to meet the demands of foreign competition, to increase the productivity of each individual worker and cut production costs to the minimum.

The farmer generally pays more attention to the price of his products than to the cost of producing them. But the prices of those commodities sold on a world market—wheat, wool, butter—are largely beyond the control of the farmer. On the other hand, the costs of production, within limitations, are subject to the farmer's control. Various items entering into production costs are virtually fixed. These include taxes, land capital costs, upkeep, and certain general expenses. But the major costs of production, excepting only land capital costs, are not fixed. They vary with the intelligence and skill of the farmer, and the power and equipment he applies to them. It is in the preparation of the land, seeding, tillage, cultivation, harvesting, and hauling of the crops that the major expenses are incurred, and to the degree to which these can be reduced, the profits of the farmer can be increased. The farmer will be compelled to accept world prices for his products so long as he must sell a surplus above domestic needs in the world markets. World consumers will buy from him only to the extent that he can sell as cheaply or more cheaply than other sellers.—Dr. A. E. V. Richardson, in the "Journal of Agriculture," South Australia.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staff of the Queensland Baby Clinics, dealing with the welfare and care of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable cases of infant mortality.

MEASURING BABY'S FOOD.

YOU may think that this is a very simple matter, but it is not so simple as it seems. On the contrary, we often find it a most difficult matter, and sometimes even impossible, to find out by the most careful questioning how much food a baby is really taking. Mothers reckon in teaspoons and tablespoons, but their spoons are not all of the same size. For instance, most of the tablespoons now used contain between one and a-half to two tablespoonfuls. This is a very serious cause of mistakes. If a mother tells us that she is giving to her baby at each meal eight tablespoonfuls of milk carefully measured with her own tablespoon, we think he is probably really getting about twelve tablespoonfuls; but we are not sure. He may be getting ten tablespoonfuls or perhaps fifteen. The most careful written directions as to quantity are of no value unless we know exactly what the mother measures the quantity with.

In measuring solids such as sugar or dried milk the danger of making large and serious mistakes is greater still. A teaspoonful of sugar is a quantity that depends not only on the size of the spoon, but on how it is filled. It may be a strictly flat teaspoonful, in which the sugar has been carefully scraped off level with the edge of the spoon. It may be a heaped teaspoonful which with the same spoon is nearly three times as much. It may be an "ordinary" teaspoonful, which is neither one nor the other, but may be anything in between. Even if we all use flat teaspoonfuls we may go seriously wrong, for some powders such as milk, sugar, and dried milk are compressible. That is, much more can be got into a flat teaspoonful if the powder is squeezed. No two women squeeze exactly alike, or with the same strength. Even the same woman does not always squeeze the same. She probably squeezes harder, if she has just had a few words with her husband. Some nurses were asked to measure flat tablespoonfuls of dried milk all with the same spoon, and by careful weighing it was found that none of the tablespoonfuls weighed the same; and the highest weight was more than twice as much as the lowest.

How to Measure Correctly.

In measuring milk and water do not, as a general rule, use spoons at all. Most feeding bottles are marked with divisions into ounces and tablespoonfuls, and these divisions are usually sufficiently accurate. In them a tablespoonful is exactly half an ounce. It is shorter to say "one ounce" than "two tablespoonfuls," and it is better, for if we can get mothers to think in ounces, they will not be muddling with spoons. If you suspect that your bottle is not correctly marked, or if you want to be very precise, get a glass measure marked in ounces from any chemist's shop.

In measuring powders like sugar or dried milk never use any sort of spoon but one. That is a "clinic tablespoon" or a "clinic teaspoon" which is of a fixed size. The two "clinic spoons" may be bought at any chemist's for one shilling, and it will be the best shillingsworth you have ever bought. Do not dip the spoon into the sugar basin or tin of condensed or dried milk. Pour the sugar or dried milk into the spoon till it is overful, but do not squeeze it. Take a knife held at right angles to the spoon and gently scrape off what lies above the level of the spoon in one sweep. You will then quickly and easily measure a true flat spoonful. Remember that "clinic" spoons should always be used to measure sugar, dried milk, and other powders, but they are not needed to measure water, milk, and other fluids.

RESPIRATORY INFECTIONS.

Influenza and other Ailments.

The "common cold," which was the subject of our discourse last month, is not the only disease whose causative germs exist in the secretions of the mouth, nose and throat. There are a host of them. Influenza, which at long intervals becomes a world-wide scourge, spreads in exactly the same way. Perhaps it would be more correct to speak of the influenzas, for there seems to be a number of similar infections as yet indistinguishable, ranging from a virulent and fatal infection to the "common cold," which is so unwisely despised and neglected. Measles commences just like a "cold," for which it is usually mistaken until the fourth day of the disease, when the rash appears on the skin. Whooping cough commences as an ordinary cough, which gradually gets worse, but cannot be recognised until a week or more have passed. Both these diseases are most infectious in the early stage, before their nature is recognised, and are therefore most easily spread. They are most common and most fatal in children under five, to whom they are conveyed directly by fingers, toys, &c., contaminated by the saliva and mucus from diseased mouths and throats, or by inhaling these secretions in the form of a fine spray which is coughed out by the sufferers. Diphtheria is similarly spread, but this disease will have to be dealt with in another discourse. The list is not yet exhausted; to it we must add scarlet fever, meningitis, and infantile paralysis, whose epidemics leave so many children sadly crippled. The last two are spread entirely not by sick people, but by apparently healthy carriers of the disease germs.

Teach Children Clean Habits.

As these diseases are conveyed by the secretions of the organs concerned in breathing or respiration, it is convenient to speak of them as respiratory infections. These respiratory infections are not lessened in any way by ordinary sanitation, which has so greatly reduced the number of intestinal or bowel infections. They are not affected at all by good or bad drainage, by nasty smells, by flies, mosquitoes or other insects. They are certainly increased by overcrowding. They are extremely difficult to deal with by isolation, partly because they are often very infectious before the sufferer realises that he is really ill, partly because most people would resent being isolated for complaints which they regard as trivial, and which indeed are so in many cases. The worst spreaders are not the very sick but those who are not too sick to go about and mix with other people. These diseases spread with the greatest ease among children, because their mothers have not understood the importance of teaching children clean habits. As is well said in the following quotation:—

> "Not only is the saliva made use of for a great variety of purposes and numberless articles are for one reason or another placed in the mouth, but for no reason whatever, and all unconsciously, the fingers are with great frequency raised to the lips or the nose. Who can doubt that if the salivary glands secreted indigo, the fingers would be continually stained a deep blue, and who can doubt that if the nasal and oral secretions contain the germs of disease, these germs will be almost as constantly found on the fingers? All successful commerce is reciprocal, and in this universal trade in human saliva the fingers not only bring foreign secretions to the mouth of their owners, but these, exchanging them for their own, distribute the latter to everything the hand touches. This happens not once, but scores and hundreds of times during the day's round of the individual. What avails if the disease germs do die quickly? A fresh supply is furnished each day. Besides the moistening of the fingers with saliva, the mouth is put to numerous improper uses, which may result in the spread of infection. It is used to hold pins, strings, pencils, paper, and money. The lips are used to moisten the pencil, to point the thread for the needle, to wet postage stamps and envelopes. Children have no instinct of cleanliness, and their faces, hands, toys, clothing and everything they touch must of necessity be continually daubed with the secretions of the nose and mouth. It is well known that children between the ages of two and eight years are more susceptible to scarlet fever, diphtheria, measles, and whooping cough, and it may be that one reason for this the great opportunity that is afforded by their habits at these ages for the transfer of the secretions. Infants do not, of course, mingle freely with one another, and older children do not come in such close contact in their play, and they also begin to have a little idea of cleanliness."

It must not be supposed that these unclean habits are confined to children. At any post office daintily dressed women may be seen needlessly licking dirty postage

stamps. Go to your bank, and the very respectable cashier will count your notes, leaving on each a collection of his own germs, meanwhile ingesting those already deposited on them by other people. Even the trained hospital nurse may be observed to moisten her fingers on her lips as she turns the pages of her notebook, heedless of the disease germs which exist in hospital dust. Let us hope that the next generation may be trained in cleaner habits. If so, they will be more healthy.

MENACE OF THE HOUSE-FLY.

SOME SUGGESTIONS FOR CONTROL.

Although the season during which the house-fly constitutes the most serious nuisance is beginning to draw to a close, it is still proving a source of great annoyance to housewives, and especially, perhaps, because of the disabilities often attached to rural conditions, to those "outback." Outbreaks of gastro-enteritis among young children have lately caused considerable anxiety, observes the Assistant Organiser of the New South Wales Agricultural Bureau in the current "Bureau Record," and the result of this disease alone, carried as it often is by the fly, should be sufficient to warrant the use of every method possible to control this dangerous insect. The habits of the fly, too, are so objectionable that the more we know of it the more we realise that it constitutes a menace to the community.

The ordinary house-fly needs little description. It is all too common and easily recognised. If we were to examine the insect closely we would see that its body and legs are covered with a great number of fine hairs. Each foot is provided with two tiny pads, which also are covered with minute hairs, secreting a sticky substance by means of which the fly holds on to the walls, ceiling, &c. The sticky substance, together with the hairs, picks up innnumerable germs as the fly wanders through garbage receptacles, drains, stables, sick rooms, and other places where harmful bacteria abound. These, of course, are readily carried to the kitchen, dining table, and, worst of all, to the baby's dummy and bottle.

Another means by which the fly distributes germs is by its method of obtaining nourishment. Its mouth is rather a singular structure, prolonged into a kind of trunk or proboscis. Thus any food it requires must be sucked up through this trunk in a liquid form. When the insect lights on a piece of solid food, it immediately proceeds to soften it by exuding some drops of moisture from its own digestive system, then slowly sucks the moistened food into its mouth. It thus leaves behind, on the food which we may be eating some liquid from its own internal organs, teeming, probably, with minute bacteria of many kinds. These, if our systems are not in a strong and healthy condition, may do untold damage by setting up within us the beginnings of diseases, such as typhoid, tuberculosis, and summer digestive complaints, especially in children.

Life History.

The life history of the house-fly is one which adds to our objection to its frequenting our living quarters. It is always a lover of filth and will seek any decaying animal or vegetable matter on which to deposit its eggs, knowing that the young will have ample organic matter for food when they are hatched. The eggs, which are minute white oval-shaped objects, about one-twentieth of an inch in length, are deposited in clusters; about 120 to 150 eggs are laid at a time, and as each female fly can lay as many as four deposits of eggs in her lifetime, we have some idea of the rapidity with which the insects increase. In warm weather the eggs hatch and the larvæ emerge in about twenty-four hours.

These tiny creamy white maggots are pointed at the head and broaden out to a blunt posterior end, and when matured are about one-quarter to one-third of an inch in length. They eat greedily, increasing rapidly in size, and shed their outside skin three times before they enter the pupal stage, which is reached in from five to seven days. The last skin of the maggot encloses the pupa, in which stage it remains for a few days, varying according to weather conditions, after which the skin breaks and the adult fly emerges.

Probably the most favoured spot for breeding is the stable manure heap, but carcasses of animals, heaps of decaying vegetable matter, sanitary pans and pits, neglected garbage tins—in short, anywhere where organic matter is allowed to decay, especially in moist places which are not too dark nor exposed to the strong rays of the sun, make ideal breeding places.

A Difficult Problem.

The control of flies is a very difficult problem, and no effective measures should be considered too much trouble in combating the pest. Firstly, the number of breeding places should be reduced to a minimum.

Garbage tins should be kept covered and as dry as possible, the contents being burned at regular intervals. Fowl yards, pig and calf pens, and milking yards should be a good distance from the house and kept as clean and dry as possible. Heaps of manure and compost, kept for the garden, should be tightly compacted and covered, if possible. If the heap is treated with borax (1 lb. to 8 cubic feet of manure) sprinkled on the surface and sprayed with water, breeding will be reduced considerably. Sanitary pits and pans, if kept covered and treated with liberal supplies of ashes, sawdust, or dry earth, become safe from the breeding of flies to a considerable extent. Various disinfectants or kerosene will destroy the maggots if allowed to hatch.

No effort should be spared in keeping flies from the house. The screening of doors and windows (better still of verandas) is the most efficient means of preventing the pest from entering the house. The framework for the gauze should be made of well-seasoned timber, otherwise it will warp, thus making cracks through which the flies can crawl. The fireplaces, too, should be screened, as the flies readily find their way down the chimney.

Protective Measures Well Worth While.

This, of course, incurs considerable expense, but the preservation of health and the saving of untold annoyance and waste of food attacked by the fly repays the outlay, and the precautions mentioned should be regarded as of primary importance in home improvement. Sticky papers are to be recommended if out of reach of children and pets—say, suspended in the centre of the room. Many types of traps, all of which are more or less efficient, are on the market; a bait of moist tea-leaves and sugar seems to attract the insects into the trap and is less objectionable than many other types of bait. Sweetened milk and water, to which formalin has been added (one teaspoonful of formalin per cup) placed in saucers out of reach of infants and pets, kills many flies, but they are apt to fall round the room and become objectionable if not swept up immediately.

Closing a room and spraying with one of the many commercial liquids or insect powders is also effective. This is best done at night, so that the dead flies may be swept up early in the morning.

At all times it should be the duty of every member of the community to take all possible measures to fight the fly and to keep food free from its attacks.

KITCHEN GARDEN.

Nearly all spring and summer crops can now be planted. Here is a list of seeds and roots to be sown which will keep the market gardeners busy for some time: Carrots, parsnips, turnip, beet, lettuce, endive, salsify, radish, rhubarb, asparagus, Jerusalem artichoke, French beans, runner beans of all kinds, peas, parsley, tomato, egg-plant, sea-kale, cucumber, melon, pumpkin, globe artichokes. Set out any cabbage plants and kohi-rabi that are ready. Towards the end of the month plant out tomatoes, melons, cucumbers, &c., which have been raised under cover. Support peas by sticks or wire-netting. Pinch off the tops of broad beans as they come into flower to make the beans set. Plough or dig up old cauliflower and cabbage beds, and let them lie in the rough for a month before replanting, so that the soil may get the benefit of the sun and air. Top-dressing, where vegetables have been planted out with fine stable manure, has a most beneficial effect on their growth, as it furnishes a mulch as well as supplies of plant food.

FLOWER GARDEN.

All the roses should have been pruned some time ago, but do not forget to look over them occasionally, and encourage them in the way they should go by rubbing off any shoots which tend to grow towards the centre. Where there is a fine young shoot growing in the right direction, cut off the old parent branch which it will replace. If this work is done gradually, it will save a great deal of hacking and sawing when next pruning season arrives. Trim and repair the lawns. Plant out

antirrhinums (snapdragons), pansies, hollyhocks, verbenas, petunias, &c. Sow zinnias, amaranthus, balsam, chrysanthemum, marigolds, cosmos, coxcombs, phloxes, sweet peas, lupins; and plant gladiolus, tuberoses, amaryllis, pancratium, ismene, crinums, belladonna, lily, and other bulbs. In the case of dahlias, however, it will be better to place them in some warm, moist spot, where they will start gently and be ready to plant out in a month or two. It must be remembered that this is the driest of our months. During thirty-eight years the average number of rainy days in August was seven, and the mean average rainfall 2.63 in., and for September 2.07, increasing gradually to a rainfall of 7.69 in. in February.

FLOWERING SHRUBS.

Lagerstræmia indica varieties.—There are many beautiful forms of this shrub on the market, and the finest varieties have been raised in Queensland—*L. Matthewsii* and *L. Eæesiana;* the colours of both are lilac, but *Matthewsii* is the darker shade. The heads of bloom of both varieties attained a length of about 24 in., and the individual flowers are a couple of inches across. The plant may be grown in any small garden, and the size may be kept at the will of the gardener. Specimens growing in Brisbane range from a few feet high to 20 ft.

The plant stands severe trimming; in fact, it stands the knife so well that it can be grown almost any height by being cut back in July every year, like a grape vine. One of the finest specimens of *L. Matthewsii* can be seen growing on the river side of the Customs House garden. Plants are easily raised from cuttings taken from the previous year's wood and planted during July and August. Also plants well established may be purchased at any of the nurserymen's stores.

Gardenias.—In the earlier days of Brisbane there were few gardens without a gardenia; now they are rarely seen. *G. Thunbergii* is one of the varieties that should be grown. The flowers are pure white, exquisitely scented, and the foliage of all the varieties are a glossy green. These plants are not too fond of pruning, and should be allowed to grow in their own way. *Gardenia florida* is mostly grown for florists' use, the flowers being perfect in form and not having the heavy perfume of the other varieties. All the gardenia family are subject to scale diseases, but are easily kept clean by occasional sprayings with boiler water that has plenty of soap in solution. The plants never attain any size, so are very useful in small gardens.

Oleander.—In the northern part of the State these plants flourish, and are much admired by visitors from the Southern States and overseas.

The plants attain a fair size if not kept within bounds. In some of our northern towns it is quite common to see plants 20 to 30 ft. high, and of many colours. The plants are grown in Brisbane, but by a few only, yet they grow just as well here as in the North. The smaller growing varieties should be more extensively grown, and the pink "Carnea," white "Madonna," and carmine "Delphine" are all good old varieties.

When growing the plants in small gardens it is necessary from their earliest stages of growth to keep them well headed back, the young wood of the previous year being the flowering wood.

Lantana.—The small varieties of lantana are not in common with the pest scattered all over Queensland, and are very beautiful when trained as hedges or shrubs. The tangerine coloured variety and the canary yellow variety are the two usually grown in Southern Queensland. Splendid specimens of these are growing in the Botanic and Museum gardens. The plants flower for nine months of the year, and will grow in almost any soil and will stand fairly hard conditions.

LANDSCAPE GARDENING.

The landscape gardener must possess a good deal of artistic taste, as he deals with the landscape and its improvement. Should alterations be necessary, they must be carried out in as natural a manner as possible, and they must be in unison with the surrounding country. Any existing natural features may be made the most of.

If trees shut out a desirable view, they may with care be removed. Tree thinning also becomes necessary when some are spoiling others. It is better to have one good specimen than several poor ones. When tree planting, the gardener must look forward, and consider their size when maturity is reached.

Broad stretches of lawn may be broken up with shrubs or specimen trees, or beds of flowers. The character of the soil and the situation must be taken into consideration when planting. It is of no use to plant trees or shrubs that are not likely to succeed, and if doubtful ones are included they must be in positions where they can be easily replaced should they fail. The character of the dwelling must also be taken into consideration.

Vista making is an important part of landscape gardening, and to carry it out the various points of vantage have to be ascertained and their values determined. The outline of the landscape from the various vantage points must be undulating, not straight or unbroken, and though special hues in greenery may be made the most of, they must not be repeated until the eye wearies of them.

Paths should be as few as possible, and each should be made for some definite purpose. They should run in bold but graceful curves, especially when made of gravel.

If summer houses are included they should not stand out aggressively, and they should be covered with creepers as quickly as possible.

TRANSPLANTING FRUIT TREES.

The transplanting of partially developed fruit trees is seldom attempted on account of the risk of failure and the trouble entailed in endeavouring to retain sufficient fibrous roots to ensure a reasonable prospect of success. Trees up to five or six years old, where subject to the necessary preliminary treatment, can not only be removed without risk of failure, but transported satisfactorily over long distances. It will be recognised that the sustenance of the plant is absorbed by the small or fibrous roots in the immediate vicinity of their terminals, and by inducing a profusion of these within a short radius of the stem the chances of failure are practically nil. A profusion of small roots may be ensured by cutting through at the desired distance from the stem (15 to 24 inches, according to the size of the tree) all roots to a depth of 18 inches. In so doing a trench is made around the tree, and the ends of roots carefully pared if the cutting has not been "clean." The trench is then refilled with soil containing a good supply of humus, and in about three months' time the original root ends will have developed a good supply of fibres. At the time of removal these are not interfered with more than can be avoided, the necessary excavation for removing the tree from its original position and severance of any lower roots being made beyond the terminals of the young root growth. The head of a large tree should be materially shortened at the time of removal. The cutting of roots in the first instance should be performed when the tree is in a dormant state; in the case of citrus, conditions are generally favourable about March. Tropical varieties handled in this manner can be removed at almost any time after sufficient roots have formed and hardened, and may be first treated at any time of the year at the period known as "between growths."—GEO. WILLIAMS, Director of Fruit Culture.

PROPAGATION BY CUTTINGS AND LEAVES.

The herbaceous character and free-growing nature of the majority of plants that are used for summer bedding renders their propagation easy. Large numbers of plants are required in as short a time as possible, and without the expenditure of much time or labour, and unless a plant is easily propagated it is of little value in the bedding department.

Autumn propagation is preferred for the more robust of these plants, cuttings at that time being both plentiful and vigorous and the season favourable for the quick production of roots. If the necessary preparation of beds, boxes, and soil has been attended to, the whole of the cuttings may be put in during autumn and rooted before the cold weather comes. It may be laid down as a general rule that all stout, free-growing cuttings prefer a strong loamy soil, while those of a more delicate nature and that have fewer roots are safest when planted in light sandy soil containing a large proportion of leaf mould.

The cuttings should be planted firmly, in rows about 6 inches apart, and should receive a good watering as soon as planted, after which they will require little attention beyond the removal of dead leaves and a sprinkling of water overhead should the weather be dry. As soon as rooted, or at least before the approach of the cold, wet weather, they should be placed in boxes, pans, or pots, in which they are to winter. For smaller quantities it will be found best to plant the cuttings in shallow boxes, in which they may be allowed to remain until the spring.

Pentstemons, phloxes, pinks, antirrhinums, and a host of other bedding plants of robust constitution may be increased in the autumn in this way. Boxes are most convenient for these purposes. The bottom should be pierced with several holes an inch or more in diameter, and covered with an inch of ashes or crocks as drainage, the box being then filled with sandy soil, using loam, leaf mould, or whatever mixture the nature of the cuttings would require.

Under certain conditions buds are formed on the leaves of a large number of plants, such buds being called adventitious, to distinguish them from the stem or normal buds, which are found on all plants, and which are borne in the axils of the leaves. It is supposed that the leaves of a very large proportion of plants possess this power to develop extraordinary buds, and that their failing to do so when tested by the gardener is due to improper treatment rather than to absolute impotence in the leaf itself.

It is, however, only in a few cases that leaf-cuttings are resorted to for purposes of propagation. Such plants as begonias, gloxinias, and a few others of more or less succulent nature are the only ones for the increase of which leaf-cuttings are employed. Numerous other plants have proved capable of propagation by this means, some of them being not at all succulent-leaved, while on the other hand, plants of excessive succulence have proved unable to form buds when tested in the same way. in some cases where leaf-cuttings have been tried, roots were freely developed but no bud was formed. Camellias may be mentioned as plants whose leaves root freely but do not develop buds, although left in the propagating house for several years.

Where it is desirable that a new plant should be propagated as abundantly and as rapidly as possible, it will be found often advantageous to place the leaves that are removed from stem cuttings in the propagating frame and treat as advised below. To anyone acquainted with the nature of the following list of plants, it will be apparent that no rule can be laid down for the guidance of the cultivator, either when based on the texture of the leaves or the nature of the plants. Begonias, clianthus, gesnera, gloxinia, hoya, lilium, watercress, and many others may be propagated by means of leaves or portions of leaves.

Turning now to the plants that are usually increased from cuttings made of leaves, a word may be said on the treatment such leaves require, and the best time of the year for the operation. Gloxinias may be dealt with all times of the year when leaves are available, the most favourable period being autumn. Well-matured leaves should be selected, avoiding those in which the yellowness of decay has appeared. The leaf-stalk may be severed at any point, it being unnecessary to secure them with heel or portion of the stem. The blade may then be divided longitudinally, so that a large leaf would form about half a dozen cuttings. It is, however, better when the blade is cut into sections, each section having a portion of the midrib attached to its base.

Some prefer severing the midrib into about a dozen pieces, leaving the blade intact. In this way a plant is obtained from each portion of the midrib, bulbils being developed on the lower end of each. Where the latter plan is adopted the whole leaf must be pegged on to a pan of sandy soil. If the leaf is divided up into smaller pieces, pots may be used, filling the pots half-full of drainage, and the other half with a light sandy soil. Into this the cuttings must be placed obliquely, so that whilst held firmly in the soil their bases are only a little below the surface. A frame in a propagating house will be the most suitable place for the cuttings till rooted. In a small bush-house a position on a shelf would answer equally well for gloxinia cuttings.

Begonias may be treated as suggested for gloxinias; or, if to be propagated on a large scale, a frame containing cocoanut fibre may be used, pegging the begonia leaves on to the fibre.

Reference may be made to the reproductive nature of some fern fronds, especially the aspdeniums, nephrodiums, aspidiums, the fronds of which usually bear buds, which eventually form plants. The requirements of such leaves, when wanted for propagating purposes, are very much the same as those of the plants themselves.

The scales which form lilium bulbs may be used for propagation, as if fresh when gathered and placed in sandy soil they root and form small bulbs capable of growing into large plants. All these exceptional ways of obtaining a stock of plants are only resorted to in exceptional cases; they are chiefly of physiological interest, showing as they do how nature has provided plants with auxiliary powers for their reproduction, which are held in reserve till called upon by the failure of the normal proper means to fulfil the functions of increase or reproduction.

VALUE OF EARTH WORMS.

It is evident that not every gardener can decide whether the common earth worm is a friend or foe. Who has not seen the gardener, when digging, industriously remove every worm found?

Now, speaking generally, these creatures are more friends than otherwise, although they are far too numerous in some gardens at certain periods of the year. As a rule, they do more good than harm by allowing water and air to pass through the soil more freely, and in other small ways assist the gardener.

They may do a little harm by working among the roots of seedlings, also, of course, on lawns, bowling and golf greens, where they may be regarded as pests, rendering the use of lime water necessary to eradicate them.

SLUGS AND SNAILS.

Slugs and snails are troublesome in many gardens—in some more so than in others, and if they are not dealt with in some way a good deal of damage may be done during the year.

The value of lime and soot is pretty well known, but both must be used carefully, or the plants it is intended to protect may be damaged. Ashes in a dry state are also effective in keeping them off. In using these insecticides they must be used in lines or around the plants in a dry, powdery form.

If the garden soil is regularly limed and kept sweet there is less chance of the slug increasing. Watering with alum water is also death to snails and slugs.

Farm Notes for August.

Land which has been lying fallow in readiness for early spring sowing should now be receiving its final cultivation prior to seeding operations. Potato-planting will be in full swing this month, and in connection with this crop the prevention of fungoid diseases calls for special attention. Seed potatoes, if possible, should be selected from localities which are free from disease; they should be well sprouted, and, if possible, should not exceed 2 oz. in weight. Seed potatoes of this size are more economical to use than those large enough to necessitate cutting. If, however, none but large-sized seed are procurable, the tubers should be cut so that at least two well-developed eyes are left. The cut surfaces require to be well dusted with slacked lime, or wood ashes, as soon as possible after cutting. Where it is necessary to take action to prevent possible infection by fungoid disease, the dipping of potatoes in a solution of 1 pint of 40 per cent. formalin to 15 gallons of water, and immersing for one hour, will be found effective. Bags intended for the subsequent conveyance of tubers to the paddock should also be treated and thoroughly dried. After dipping, spread out the potatoes and thoroughly dry them before rebagging. Where the tubers are cut, the dipping is, of course, carried out prior to cutting.

Arrowroot, yams, ginger, and sugar-cane may be planted this month in localities where all danger from frosts is over.

Maize may be sown as a catch crop, providing, of course, that sufficient soil moisture is available.

Sweet-potato cuttings may also be planted out towards the end of the month.

Weeds will now begin to assert themselves with the advent of warmer weather; consequently cultivators and harrows should be kept going to keep down weed growths in growing crops and on land lying fallow, as well as on that in course of preparation for such crops as sorghums, millets, or panicums, maize, and summer-growing crops generally.

Tobacco seed may be sown on previously burnt and well prepared seed-beds.

Orchard Notes for August.

THE COASTAL DISTRICTS.

The bulk of citrus fruits, with the exception of late ripening varieties, will now have been marketed, and cultural operations, pruning, spraying, &c., should be receiving attention. Where trees show indication of impaired vigour, pruning should be heavy, both in respect of thinning and shortening branches. Where trees are vigorous and healthy a light thinning only will be necessary, except in the case of the Glen Retreat Mandarin, which in coastal lands is invariably disposed to produce a profusion of branches with consequent overproduction and weakening of the constitution of the tree in addition to the fruit being small and not of the best quality. Where white louse is present on the main stem (where it almost invariably makes its first appearance) or branches, spraying with lime sulphur solution in the proportion of one part of the concentrate to ten parts of water after the centre of the tree has been opened up by pruning will be found most beneficial.

In dealing with trees which show signs of failing, investigation should be made near the ground level for indications of collar rot and in the North Coast district particularly, for the presence of the weevil root-borer which may attack the roots in the vicinity of the thin bases or at some feet distant. A very light application or paradichlor, buried a few inches under the soil in circles around the tree and the surface tamped firm is considered efficacious in destroying the pest. The distance between the circles (shallow openings connected throughout) should not be more than 18 inches. It may be necessary to repeat the application at three to four weeks' intervals.

Spraying with Bordeaux mixture is desirable as it will, if properly applied, destroy the spores of various fungi later attacking both foliage and fruit.

Where for any reason healthy trees of vigorous constitution are unprofitable they should now be headed back—in fact, the whole of the top removed, leaving only a few selected "arms" of previous branches, all other branches being cut clean away at their base. Three or four main arms, whose length will vary from 2 to 4 ft. according to the size of the tree, will form the future head of the tree and from these numerous shoots will originate; these shoots in turn are reduced according to circumstances, usually from two to five on each arm, and given fair attention they will be in a fit condition to receive selected buds from a prolific tree by next autumn. It is advisable when the shoots intended for budding have attained a length of about 6 inches to nip off their terminals for the purpose of stiffening their growth, otherwise they are liable to be blown off by winds. All branches or parts removed in pruning should be carefully collected and burned. Applications against pests and disease could hardly be satisfactory if the material for reinfestation is available throughout the orchard.

Working the land is essential, and disc implements give best results. Before ploughing it is advisable to apply the necessary fertiliser, not just around the trees beneath their branches, but over the whole orchard, the feeding roots mainly extending beyond the extremities of the branches. The depth to which ploughing should be effected will depend on the nature of the soil and its original preparation. Where the subsoil is of a permeable nature, or has been broken up in the first instance, ploughing could be much deeper than on land where due consideration had not been given to this practice. It will also be noted that among some of our light loams that fertility is confined to a shallow depth, where it would be futile to persist in deep ploughing to force the roots into a subsoil from which they could derive but little sustenance. Following upon ploughing, the soil should be further treated until finely broken; the implement necessary will depend upon the constituency of the soil. Generally a good harrow will meet all requirements. On the completion of ploughing between rows an open furrow should not be left on the border or margin, but two or three furrows should be turned back to fill this and the whole then worked sufficiently to leave an even surface throughout the orchard. Except for the purpose of turning in fertiliser or green manure, a good type of disc cultivator can be substituted for the plough and will give at least an equal result.

The planting of trees may be continued and with the exception of custard apples (which should be left until the end of August) should be expedited. The planting of citrus trees this season has been inextensive, but there is a much better outlook for orange production than has been previously offered, and attention should be confined mainly to good varieties of this class—viz., Jaffa and Siletta, with a lesser quantity of late Valencia. The preserving of orange juice will very materially assist in the absorption of our crop, and the fact that the trees develop much more rapidly in this State than in Southern producing regions is distinctly in our favour,

also our fruit contains a much higher sugar content. This, however, is not to be accepted as an invitation to continue the practice of sending immature fruit to the Southern markets.

Grape vines should be pruned, and where cuttings for planting are required these should be selected, trimmed, and heeled in slightly damp soil. Canes intended for cuttings should not be allowed to lay about and dry out, but treated the day they are severed from the plant. Cuttings are frequently made of excessive length. Ten to twelve inches is a fair length, allowing for insertion in the soil to admit of the top bud with a short section of the internode to protrude. Growth is only desired from the upper or exposed bud.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

All pruning other than that applied to peaches and varieties which are late in coming into growth should be completed this month, and the planting of young trees, if not already done, should no longer be delayed. Early planting is preferred, the sooner after the fall of leaves the better. The time is opportune (when there is indication of the buds swelling) to work over (where the stock is reasonably vigorous) unprofitable trees. Strap grafting, as advised by the local field officers, is the most satisfactory method of top-working deciduous trees.

The pruning of vines should be postponed as long as circumstances permit, and these can only be gauged on actual observation as they are subject to much variation.

Late spraying against San José scale where present should be applied with an efficient oil emulsion before any growth appears. Each particular brand has its advocates. Where the scale is persistent, a 2 per cent. solution of Volck may be applied subsequent to the appearance of foliage. Both of these sprays are efficacious against peach or other aphis at a much reduced strength. One per cent. has given satisfactory results. The usual winter working of the land is essential for the retention of moisture and aeration of the soil, but in shallow soils in which many orchards are planted deep working is most detrimental. The matter of seedling stocks for apples and the inferior plants frequently received from Southern nurseries prompts a query as to how many seeds have been stratified for spring planting, and if any effort is being made towards raising a local supply of nursery stock. In earlier years citrus planters were much dissatisfied with Southern supplies, which led to the establishment of local nurseries and later to bud selection. There is certainly sufficient enterprise and energy in the Stanthorpe district to make a similar attempt. Its application only is required.

TO NEW SUBSCRIBERS.

New subscribers to the Journal are asked to write their names legibly on their order forms. The best way is to print your surname and full christian names in block letters, so that there shall be no possibility of mistake.

When names are not written plainly it involves much tedious labour and loss of valuable time in checking electoral rolls, directories, and other references. This should be quite unnecessary.

Some new subscribers write their surname only, and this lack of thought leads often to confusion, especially when there are other subscribers of the same surname in the same district.

Everything possible is done to ensure delivery of the Journal, and new subscribers would help us greatly by observing the simple rule suggested, and thus reduce the risk of error in names and postal addresses to a minimum.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	July, 1930.		August, 1930.		July, 1930.	Aug., 1930.
Date.	Rises.	Sets.	Rises.	Sets.	MOONRISE. Rises.	Rises.
					a.m.	a.m.
1	6.46	5.5	6.37	5.19	10 36	10.50
2	6.46	5.5	6.36	5.20	11.9	11.25
3	6.46	5.5	6.36	5.20	11.43	12.0
					p.m.	p.m.
4	6.46	5.6	6 35	5.21	12 15	12.43
5	6.46	5.6	6 34	5 22	12 49	1.33
6	6.46	5 7	6.33	5 23	1.22	2.25
7	6.46	5.7	6.33	5.23	2.1	3.19
8	6.46	5.8	6 32	5.24	2.47	4.13
9	6.45	5 8	6 31	5 24	3 36	5 8
10	6 45	5.8	6.30	5.25	4 28	6.4
11	6.45	5.9	6 29	5.25	5.24	6.52
12	6.45	5.9	6.29	5.26	6.18	7.50
13	6.45	5.9	6.28	5.26	7.11	8.42
14	6.45	5.10	6 28	5.27	8.7	9.34
15	6.45	5.10	6.26	5.27	9.0	10.27
16	6 45	5.11	6.25	5.28	9.53	11.27
17	6 44	5.11	6 24	5.28	10.46	...
					a.m.	a.m.
18	6.44	5 12	6.23	5.29	11.39	12.27
19	6 44	5.12	6.22	5.29	...	1.31
					a.m.	
20	6.43	5.13	6.21	5.30	12 38	2.34
21	6.43	5.13	6.20	5·30	1.37	3.39
22	6.43	5.14	6 19	5.31	2.43	4.41
23	6.42	5 14	6 18	5.31	3.47	5.35
24	6.42	5.14	6.17	5.32	4.54	6.21
25	6.41	5.15	6.16	5.32	5.58	7.2
26	6.41	5.15	6.15	5.32	6.58	7.36
27	6.40	5.16	6.14	5.33	7.48	8.11
28	6.40	5.13	6.13	5.33	8.30	8.45
29	6.39	5.17	6.12	5.33	9.7	9.19
30	6.39	5.17	6.11	5.34	9.40	9.57
31	6.38	5.18	6 10	5.34	10.15	10.40

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

Phases of the Moon, Occultations, &c.

3 July	☾	First Quarter	2 3 p.m.
11 ,,	○	Full Moon	6 1 a.m.
19 ,,	☽	Last Quarter	9 29 a.m.
26 ,,	●	New Moon	6 41 a.m.

Apogee, 13th July, at 11.36 p.m.
Perigee, 26th July, at 8.6 p.m.

On the 16th Venus will pass from west to east of Neptune, on its northern side. Neptune will be invisible without telescope or binoculars, but Regulus, the brightest star in the fine constellation Leo, will be 2½ degrees westward of Venus. They will be approaching the western horizon, 12½ degrees north of west, about two hours after sunset. Observers using a telescope will find Neptune only 2 minutes westward of Venus, but 40 minutes southward.

Mercury will rise at 5.37 a.m. on the 1st. On the 15th it will be on the far side of its orbit, beyond the Sun and invisible.

Venus will set at 7.47 p.m. on the 1st and at 8.2 p.m. on the 15th.

Mars will rise at 6.12 a.m. on the 1st and at 3.0 a.m. on the 15th.

Jupiter will rise at 6.12 a.m. on the 1st and at 5.31 a.m. on the 15th.

Saturn will be in conjunction with the Sun on the 1st and therefore invisible. It will be on the far side of its orbit, about 885,000,000 miles beyond the Sun. On the 15th it will rise at 4.1 p.m.

The Southern Cross will reach the highest point of the circle, 60 degrees in diameter, which it makes daily around the south-celestial pole, at about 6 p.m. on 1st July and about 4 p.m. on the 31st. It will then be on the meridian due south, in an erect position, reaching a height of 57 degrees at Brisbane, but only 50 degrees at Charters Towers, or 49 degrees at Townsville, reckoning by a line through the cross from the two pointers.

1 Aug.	☾	First Quarter	10 26 p.m.
9 ,,	○	Full Moon	8 58 p.m.
17 ,,	☽	Last Quarter	9 31 p.m.
24 ,,	●	New Moon	1 37 p.m.
30 ,,	☾	First Quarter	9 57 a.m.

On the 5th Mercury will pass Neptune, apparently very close to it on its northern side. Telescope or binoculars will be required to see the latter. The two planets will set an hour and a-half after the Sun, about 6 degrees further north on the western horizon.

The Moon will pass from west to east of Saturn at midday on the 6th when below the horizon. When both become visible in the east, soon after sunset, Saturn will be about 6 degrees north-westward of the gibbous moon.

Mars will be in conjunction with the Moon at 4 a.m. on the 20th, an hour and a-half after they have risen, Mars being 4 degrees to the southward of the Moon.

On the following morning, at 8 o'clock, the Moon will pass 5 degrees northward of Jupiter, but too much in the direction of the Sun to be noticeable. On the 24th Neptune will also be passed in the daytime.